The Fleet Owner

Vol. 25
1930

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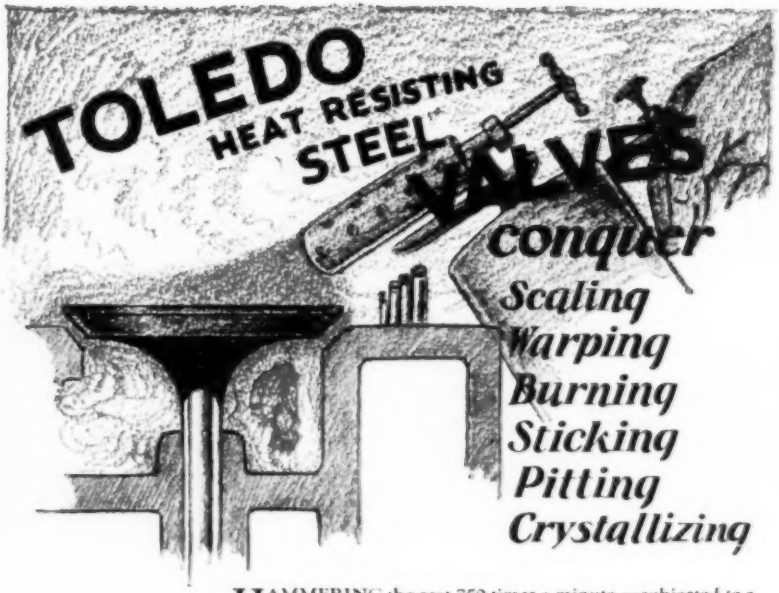
Facts About Timing Chains
Repairing All-Steel Bodies
How to Service AC Fuel Pumps
Fire Protection in the Garage
What's New in Equipment



always Check the Valves First

HAMMERING the seat 750 times a minute,—subjected to a heat as intense as though from a blow torch, as the cylinder fires 750 times each minute—that's what a valve must withstand in a motor at 1500 R.P.M. No chance to cool; fuels of various grades; greater speed now and then,—but perfect idling always.

No wonder ordinary valves can't withstand this hammering and heat as do TOLEDO Heat Resisting Steel VALVES which are made complete in our own plant, forged at white heat from the world's finest heat resisting steel and machined to car manufacturer's blue print specifications.

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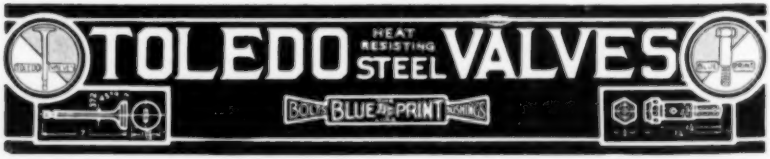
TOLEDO VALVES as sold to the Replacement Trade are guaranteed to be of Original Equipment Quality in every particular

The Toledo Steel Products Co.

Toledo, Ohio, U. S. A.



Erie finds a plug that averages 27,735 miles

This Erie fleet of buses uses Robert Bosch Pyro-Action Spark Plugs exclusively.

LOW spark plug mileage! High spark plug costs! So often fleet owners make the same complaint.

But not the Erie Railways Company and Erie Coach Co., Erie, Pa. In a letter to a well known bus publication, they write: "We tested 4 sets of Robert Bosch Pyro-Action Spark Plugs. Average life of 24 plugs 27,735 miles. We have used Pyro-Action Plugs exclusively for 18 months, operating 70,000 miles per month."

Due to Pyro-Action, these plugs will not become so hot as to burn off the electrodes. They will not run so cold that carbon can collect and cause fouling. Corrosion and fouling thus eliminated you can expect real long life service from Pyro-Action Spark Plugs.

But like all other truck and bus equipment any spark plug must be properly selected for the type of engine and the service for which it is used. The service station from whom you bought your Robert Bosch Super-Energy Magneto will be glad to help you select the correct Robert Bosch Pyro-Action Spark Plug for your trucks or buses. Or write us direct for full information.

ROBERT BOSCH MAGNETO CO., INC.
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All Robert Bosch Pyro-Action Spark Plugs bear the full name "Robert Bosch" and this trademark:

Robert Bosch
Pyro-Action
Spark Plugs

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A SURPLUS of hydraulic power to lift heavy loads—quickly, easily and safely—with a minimum of effort by the user, has put the Pedersen OILJAK in a class by itself in its field.

The Pedersen OILJAK is built to stand the gaff of heavy-duty service work—it will not break or crack under heaviest loads or roughest handling.

Once you have experienced the practical advantages of the Pedersen OILJAK you will be satisfied with no other—mechanical or hydraulic.

Made in various sizes and capacities to meet every automotive requirement.

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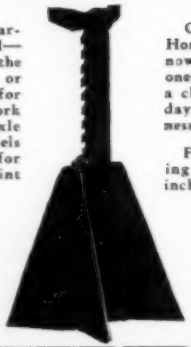
The only horse on the market made entirely of steel—plate and drop-forged, the Hi-Lo Horse cannot break or wear out. Indispensable for spring, gear and wheel work and also for brake and axle adjustments. The tall models are particularly suitable for body builders and paint shops.



Order a pair of Hi-Lo Horses from your jobber—now—you'll want additional ones as soon as you've had a chance to test their everyday convenience and usefulness.

Furnished in models ranging in height from 9½ inches to 41½ inches.

Send for literature and complete information covering these jacks and horses.

The OIL JACK CO., Inc.
Ampere, New Jersey

"For Those Who Service Their Own"

The FLEET OWNER

Published Monthly by

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Editor

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ALWAYS AND EVERYWHERE

Year on year, day in and day out, Dodge Trucks go right on working, right on earning for their owners.

And when adjustments or repairs are needed, owners are sure to find, close by, a reputable Dodge Brothers dealer—a local business man—with a complete stock of parts and facilities for rendering service that is prompt, skilled and reasonable in cost.

DODGE TRUCKS

The FLEET OWNER

"For Those Who Service Their Own"

PUBLISHED monthly in the interests of Automotive Fleet Owners who maintain their own Repair and Service Shops, and devoted to the better operation and maintenance of Trucks, Passenger Cars, Busses and Taxis.

HENRY CLAY FISCHER, Editor

Vol. 4 **New York, January, 1930** **No. 1**

The Shows Are *Your* Shows

IN many sections of the country, automobile and motor truck shows will be held during January and February. Some, if not all, of these exhibitions will house the latest models of trucks, busses, passenger cars and tractors, and will directly reflect the progress that has been made during 1929.

Of most concern will likely be the National Shows in New York and Chicago, at which a goodly amount of commercial vehicles and automotive shop equipment will be exhibited.

Various other shows are also worthy of attendance. Cleveland offers something of interest to the fleet owner, in the form of a commercial vehicle exhibition, in conjunction with which a truck convention will be held. The dates are the 29th to 31st of this month.

Then, last but not least, there is the Road Builders Convention and Show to be held in Atlantic City, January 13th to 18th. Those interested in the design, construction and usages of highways (every fleet operator should be) will find this educational

and interesting. Someone in the organization should be delegated to "take in" at least one Show this year, for, truly, the Shows are *your* Shows.

Don't Neglect Those Gaskets

FLEET maintenance men with a reputation for good work have always recognized the importance of careful gasketing of pans, timing chain covers and other oil containing parts. In addition to the new rings, valves, pins and bushings, etc., needed, a new pan gasket for every job that includes an oil-pan takedown, should be ordered.

All of us are familiar with that trail of waste oil which begins on the garage floor, continues along the curb and extends out over every paved highway in the country—all as a result of leaking oil pans.

A carelessly fitted pan and an old gasket are the ideal combination to make the fleet owner pay twice over for his oil. Oftentimes bearings are burnt out and other serious damage inflicted, because the mechanic did not use a new gasket or was careless in its installation.

Those fleet operators who are far-sighted are stocking a representative assortment of oil-pan, timing-chain cover and rear axle housing gaskets, to cover the requirements of the particular makes of vehicles in their fleets. The cost of a new gasket is too small to risk burned-out bearings and the accompanying loss-of-use of the vehicle involved.

The Cover Picture

THIS month on our front cover is depicted a tractor clearing a heavy drift of snow from one of the main highways in New York State. Of particular interest will be the plow, which is of the v-type, with a square point that "lifts" the snow from the road, while the v-shape construction "pushes" it out to either side. The snow is then carried farther out by two wings to a width of from sixteen to eighteen feet. These wings are attached one on each side of the tractor, and can be raised or lowered as desired. (Photo by courtesy of Republic Motor Truck Co., Inc.)

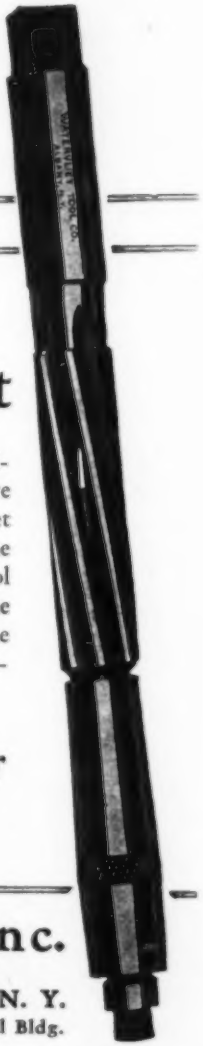
The Editor

WATERVLIET

Spiral Expansion Aligning

REAMERS

For Piston Pin Bushings on All Cars and Trucks



Now with Floating Pilot

The newest development in Watervliets, and already accepted enthusiastically by automotive mechanics . . . a double tapered reversible collet guide that fits snugly in any bushing within the reamer's range and automatically holds the tool in positive alignment. The floating pilot and the over-expansion check nut make the genuine Watervliet as nearly "fool proof" a tool as mechanical genius has yet devised.

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The Check Nut Prevents Over-Expansion

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A Fleet Operator's Views on

Fuel Specifications

By Adrian Hughes, Jr.*

DISCUSSION of fuel specifications from the viewpoint of the purchaser should be helpful in the efforts that have long been under way to improve economies in the propulsion of vehicles with crude-oil products. Today, few operators know what kind of fuel they need, or how to specify the fuel they want to purchase. Most of them, however, are dissatisfied with the situation, and many of the larger operators are making efforts to obtain definite information about fuel and fuel performance with a view to finding a remedy for it. The subject is highly technical, and the average operator experiences great difficulty in attacking it. Frank discussion by representatives of the oil refiners, the engine manufacturers, and the operators so that each shall understand the requirements and the problems of the others, followed by a sincere effort to cooperate, is certain to result in an improvement in the situation that will be satisfactory to all.

In the operation of motor-trucks and motor-coaches, large-fleet operation is becoming the rule rather than the exception. This tendency is increasing and undoubtedly will reach large proportions and have an increasingly greater effect on fuel specification, on the kind of fuel produced by the refiners, and on engine design. The larger a fleet operation becomes, the better it will be equipped with capable engineers who will carry on reliable experiments and research leading to more satisfactory service and greater economies. Also, it will mean that both fuel and equipment will be purchased in larger quantities.

The object in this article is not to attempt to give a technical discussion of fuel but rather to present conditions which are met by the operator in the purchase of fuel and the practical limitations of specifications in this connection. The technical

* *Supt. of bus transportation, United Railways & Electric Co., Baltimore, Md.; Member, Society of Automotive Engineers.*
This paper was read at a recent meeting of the S.A.E.

features of fuel production and engine design can best be handled by the engineers who have specialized in this study. Valuable information already has been contributed by them, and their research and experimenting is continuing. We are more concerned here with the practical application of their findings.

The Operator's Fuel Requirements

FOR an operator to state definitely his requirements for a fuel is comparatively easy. They are as follows:

(1) Economy; that is, high mileage per gallon of fuel.

(2) Power, both for accelerating and for heavy pulling. This includes smooth engine-performance.

(3) Freedom from knocking.

(4) Low engine-maintenance cost and long life of engine. This includes the minimum dilution of the lubricant and the minimum carbon formation, which interferes with economy, power and long life, and causes interference with service for frequent cleaning.

However, the operator finds it very difficult to prepare a specification that can be submitted generally for bids in an open competitive market and that will assure his obtaining the required qualities in the fuel. Although the results that are required from the fuel are well known, only recently has any clear understanding been reached as to the definite relations between these operating results and the make-up of the fuel, even by the specialists. Even among them, some of the points have not been entirely cleared up. Operators in general are not conversant with these technical facts and if they were they would still be facing the difficulty of specifying tests that would ensure the required qualities and that could be performed conveniently in practice.

One of the complications in determining the qualities a fuel should have is that it must function under many *extreme* conditions. No other device is required to operate under such extremities of load or temperature as does the automotive engine. As such conditions cannot be avoided, it appears at present that the fuel must have the necessary qualities to meet them. Another difficulty met in practice is that, as nearly every fleet consists of groups of vehicles purchased at different times and from various manufacturers, the engine characteristics of each group may vary widely. Therefore, to obtain satisfactory operation and the maximum economy, several grades of fuel might be required.

Our Motorcoach Fleet Experiences

THE fleet of the Baltimore Coach Co., which is the motorcoach operating subsidiary of the United

Adrian Hughes, Jr.

Railways & Electric Co. of Baltimore, consists of 122 vehicles, all mechanically driven. The fleet includes engines of eight distinct types or models. The operation is entirely within the city with the exception of the chartered business, and covers about 2,500,000 motorcoach miles per year. From 1915, when operation was started in Baltimore, up to 1924, gasolines were purchased in the open market without the use of a specification. From 1915 to 1919, the gasolines showed a decrease in performance, as ascertained by the observations and mileage records of the operating superintendent. As is well known, the gasolines produced in the years 1917 to 1919, inclusive were rather unsatisfactory. Trouble experienced during that period is now known to have been due largely to heavy ends of the fuel not being burned dry. As a result, dilution was excessive and numerous difficulties followed.

At about that time benzol blends appeared in Baltimore. Various gasolines had been tried but a 50-per cent benzol blend seemed to give the best performance, and engine knock was eliminated or at least reduced. The fleet then consisted of only 26 buses, all of one model. In 1924, with the advice of a firm of local chemists, a specification calling for a 42-per cent benzol blend fuel having an initial boiling point of 132 deg. Fahr. was prepared, as it had been concluded from experiments that such a fuel would not produce any appreciable engine knock. This fuel proved rather satisfactory, the price differential was not great in comparison with straight gasoline, and an appreciable saving in engine maintenance and carbon cleaning seemed to be apparent. Experiments in 1927 with the straight gasoline then available, which was very superior to that produced eight or nine years before, showed that the cost per vehicle mile for fuel was probably slightly higher with the benzol blend but it was considered that the saving elsewhere justified its use.

Present Motorcoach Fuel Specification

IN the fall of 1928 a revised specification, in which the benzol was reduced to 35 per cent, was adopted by us. Blended fuels were being used more commonly by oil companies and this reduction in benzol content was made for the sole purpose of trying to get into a more competitive market. That this was rather difficult to do at that time probably is generally known, and we learned. Our revised specification reads in part as follows:

"This 35 per cent special motor fuel to be furnished by the oil company shall not only contain 35 per cent benzol, but the gasoline content shall be a special California grade which itself contains some of the antiknock properties of benzol.

The oil company shall use this California gasoline in the 35 per cent blend, and, by the addition of some natural gasoline, the 35 per cent blend shall meet the following specifications:

(1) It shall not contain less than 35 per cent benzol.

(2) The benzol shall be of such grade that not less than 80 per cent by volume shall distill below 212 deg. fahr., and its end-point shall not exceed 300 deg. fahr.

(3) The finished fuel shall have an initial boiling-point during the months of November, December, January, February and March not above 125 deg. fahr., and during the months from April 1 to October 31, not above 132 deg. fahr., and the end-point not above 420 deg. fahr.

(*Please turn to page* 14)

Don't let snow cut your profits

Prompt deliveries build a profitable reputation for service. Equip every delivery car and truck with WEED Chains. The initial cost is paid many times over in *actual added profit.*

Be sure you get the genuine. WEED Chains are made for all types and sizes of pneumatic and solid truck tires. Sold everywhere.

When clearance is not sufficient to permit the use of dual chains, chains should be used on outer tires.

ACCO

AMERICAN CHAIN COMPANY, *Inc.*
BRIDGEPORT, CONNECTICUT.

World's Largest Manufacturer of Welded & Weldless Chains for All Purposes. District Sales Offices: Boston, Chicago, New York, Philadelphia, Pittsburgh, San Francisco. *In Canada:* Dominion Chain Company, *Limited,* Niagara Falls, Ontario.

WEED CHAINS

How Baltimore's Largest Motorcoach Fleet Operator Specifies Fuel for Use in His Busses

(Continued from page 12)

(4) The finished fuel shall yield upon distillation not less than 85 per cent by volume at 360 deg. fahr., and not less than 95 per cent by volume at 405 deg. fahr.

(5) The sulphur content shall not be greater than 0.15 per cent."

Having in mind the continuance of our investigations on a somewhat larger scale, the contract for fuel included a specification for straight gasoline and also a provision for changing to any other kind of fuel that might be found desirable, with suitable arrangements for arriving at a price.

In January, 1929, arrangements were made for a rather ambitious program of investigations to extend over a period of two years, the duration of the present contract, with the object of determining definitely the kind of fuel that would be most satisfactory and economical. The test will include standard gasolines and blends, and possibly special fuels.

Two-Year Program of Tests

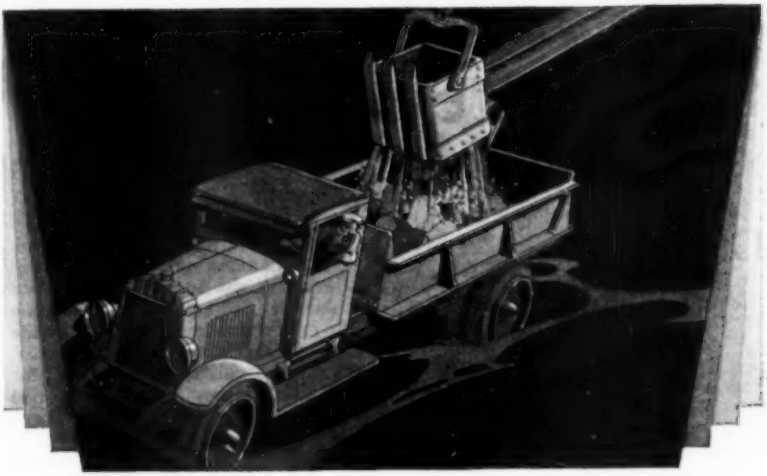
TWO groups of motorcoaches are under test operation at the present time. The first group consists of nine double-deck coaches operating on a route through the center of Baltimore from north to south, the north end being in the residential section, and the south end being in the congested business section. The topography is rolling, with a general down-grade from north to south. These motorcoaches are housed in a closed, but poorly heated, garage, and are operated about 25,000 coach miles per month. They are equipped with six-cylinder engines of 77 maximum b.hp. and the conventional vented cooling-system.

Certain straight gasolines produced a fair mileage per gallon but failed to give the necessary maximum power when required. These gasolines were found to have relatively equivalent initial boiling and 50 per cent points in comparison with other more satisfactory gasolines, but their end-points were in the neighborhood of 395 to 400 deg. fahr., whereas those of a higher end-point, around 415 to 425 deg. fahr., gave ample power under all conditions. In tests conducted so far, these high-end-point gasolines have not given much trouble from crankcase-oil dilution but, as the tests progress into the winter months, more comprehensive information may be available.

The second group consists of ten 25-passenger single-deck coaches equipped with four-cylinder engines, and are operated on a city route from east to west, the east end being in the residential section and the west end in the congested business section. Here again the topography is rolling, the grades being about equal in both directions. Parking is largely restricted on this route, and the boulevard-stop system applies over about 60 per cent of the distance. However, the stops, slowing down and acceleration made necessary by receiving and discharging passengers are numerous. These motorcoaches are housed in an unheated garage and are operated about 26,000 coach-miles per month.

The four-cylinder engines develop 54 maximum b.hp. and are equipped

(Continued on page 63)



ALUMINUM TRUCK BODIES
HAUL EVERY 11th LOAD FREE

Weighing only ⅓ as much as iron or steel, Alcoa Aluminum Alloys cut truck body structural deadweight to a minimum.

On a standard 6 ton truck as much as 1,400 pounds of extra pay load can be gained. The original cost of $400 for the Aluminum body can easily be written off in 7 months.

Figure it another way, and you see that the same truck, with an Alcoa Aluminum body, will work 29 days a year for nothing—run every 11th trip free—and this without change in engine power.

Write our nearest office stating type of truck and body you intend to use. We'll gladly send you the cost cutting information you need. ALUMINUM COMPANY of AMERICA, 2461 Oliver Building, PITTSBURGH, PA. Offices in 19 Principal American Cities.

ALCOA ALUMINUM

ALCOA

How to Repair *Part II*

All-Steel Bodies

Straightening Doorways, Corner Posts; Hanging Doors; Where to Check for Wear and Lubricate

DOORWAYS or posts that have been bent can very often be straightened by using a turnbuckle or jack between the posts. By heating the bent post and turning up on the jack or turnbuckle, the bent post can be brought out to the correct contour.

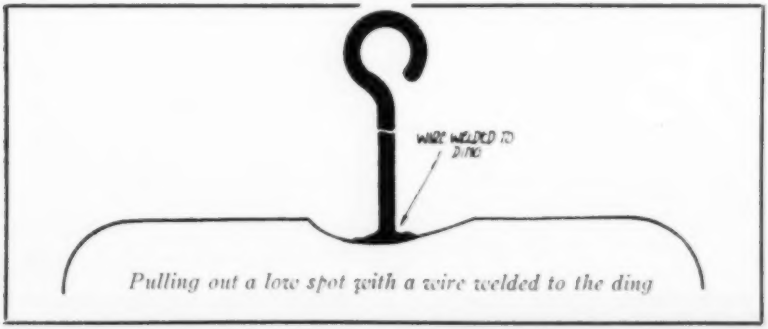
If it is necessary to straighten the body at a point where the metal has become thin, cut out the dinged or broken section and patch it with a sheet steel patch. This was described in Part 1 of this article (appearing in our last issue) under the heading "Patching." Patching can be done so that it is impossible to see where the patch was welded into place and the patch and weld will be as strong as ever, in fact the weld will be stronger.

Do not file away wrinkles or ridges as in doing so you are weakening the body structure by removing metal. Shrink the spot by heating and hammering with a wooden mallet. When using the jack or turnbuckle, protect the bent portion with heavy steel bars and apply the straightening pressure on the bar. Clamp the steel bar to the frame or post with clamps; heat and pound and screw down the jack or turnbuckle.

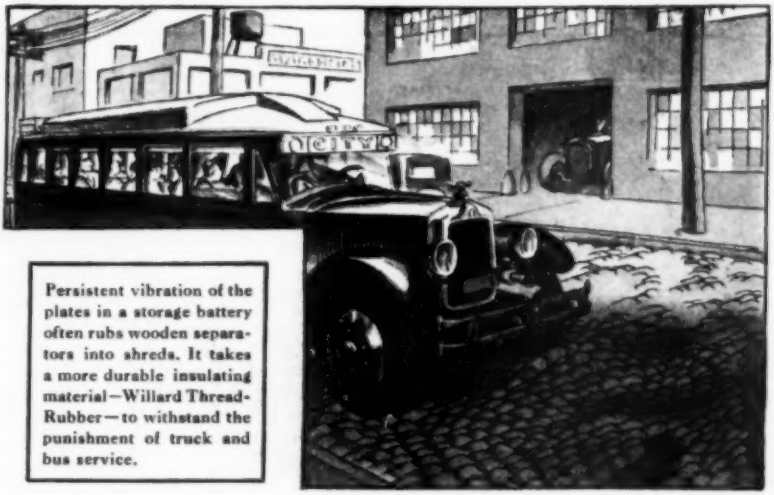
Experience will demonstrate the fact that parts ordinarily given up as not repairable can be saved by straightening, which is often cheaper than replacement, saving expense.

If it is difficult to renew a bead or core by straightening do not take the time to do this but straighten the appearance of beads or panels by soldering. Solder does not add strength but will renew a line and greatly improve the appearance.

To remove a ding or low spot from a post or any other unit where



Pulling out a low spot with a wire welded to the ding



Persistent vibration of the plates in a storage battery often rubs wooden separators into shreds. It takes a more durable insulating material—Willard Thread-Rubber—to withstand the punishment of truck and bus service.

Here's what rough roads do to batteries.

Willard fortified quality withstands such punishment in either bus or truck use.

No matter how tightly a battery is assembled, no matter how firmly it is clamped in the frame, there is always vibration between its plates. Ordinary wood insulators eventually wear through under this action, a short circuit results and the battery goes dead.

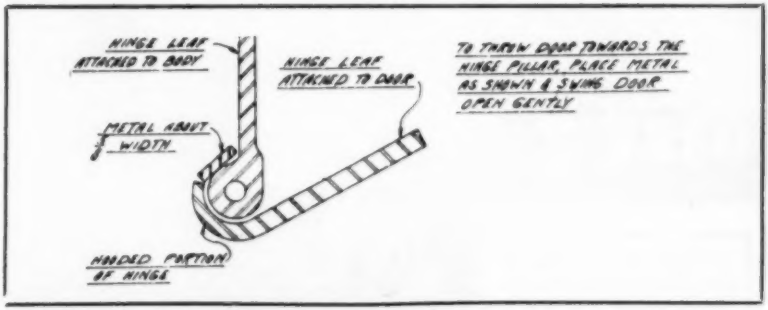
Willard batteries with Thread-Rubber Insulation are doubly fortified against such failure. Willard plates are molded, not stamped, and have no sharp edges to cut into the insulation. And Willard Thread-Rubber Insulation is virtually wear-proof, even under adverse conditions.

Willard Storage Battery for Bus Service, Type GHLR-29

STORAGE BATTERIES

Willard

CLEVELAND·OHIO


HINGE LEAF ATTACHED TO BODY
HINGE LEAF ATTACHED TO DOOR
METAL KNUT WIDTH
HANDED PORTION OF HINGE
TO THROW DOOR TOWARDS THE HINGE PILLAR, PLACE METAL AS SHOWN & SWING DOOR OPEN GENTLY

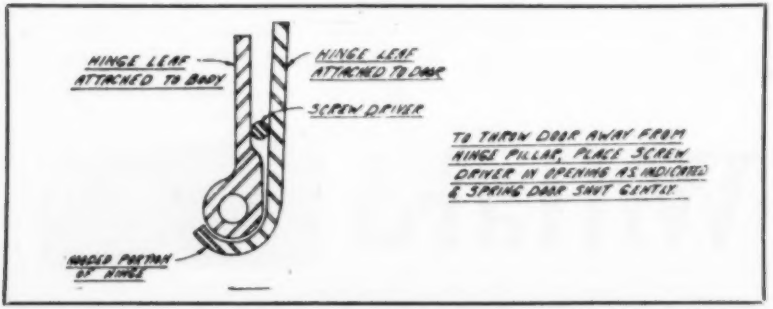
it is difficult to get at the inside, weld a piece of welding wire to the low spot. Form a handle on the wire as shown in the illustration. Next, heat the area on and around the low spot to a cherry red and pull the ding or low spot out to the contour of the unit.

When badly distorted posts are encountered and straightening appears impractical, remove the old post by sawing about 3 or 4 inches from the top of the doorway and the same distance from the bottom. Insert the new assembly by cutting it to size and welding it into place.

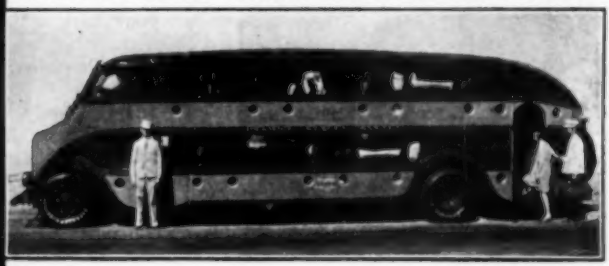
Door Hanging

IF the hinges spring when the door is closed, this may be due to a repair having been made at some time or other on the posts or pillars to which the door fastens and too much weld metal used, causing a mound or lump at the reveals. If this condition is encountered, chip off the lumps and file down but do not file so much that there is no weld left. Touch up with metal primer and lacquer.

Check up on the rivets to see that the heads do not project too far into the opening, thus having a tendency to hold door open. See that the female dovetail on the post or pillar is not worn or jammed. New dovetails are inexpensive and prevent much inconvenience due to ill-fitting doors. See that the wind-cord is not binding. If interference


HINGE LEAF ATTACHED TO BODY
HINGE LEAF ATTACHED TO DOOR
SCREW DRIVER
HANDED PORTION OF HINGE
TO THROW DOOR AWAY FROM HINGE PILLAR, PLACE SCREW DRIVER IN OPENING AS INDICATED & SPRING DOOR SHUT GENTLY

PICKWICK
USES LEMPCO
GUN ALLOY BRAKE DRUMS
To reduce maintenance costs



What better endorsement can a product win than the enthusiastic testimony of users?

Pickwick Stages System, of Los Angeles, California, use Lempco Gun Alloy Brake Drums to reduce brake maintenance costs. Here is what Tom Stone, Superintendent of Maintenance & Equipment, says about Gun Alloy Drums:

> **"We find that Lempco Gun Alloy Brake Drums are increasing the life of our brake linings; they stop scoring of the bands; there is much less necessity for brake adjustments; they outwear any drums we have ever used; we are getting better tire mileage, and in every way they are proving more than satisfactory."**

Gun Alloy Drums will slash *your* brake maintenance costs to the bone, too. Stocked in sizes to fit every type of truck, bus and taxicab by good jobbers everywhere.

Write for the name of the nearest Lempco jobber.

LEMPCO PRODUCTS

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Cable Address: Lempco, Bedford, Ohio, U. S. A.

After the repair is made, the damaged unit is finished in lacquer to match the original color.

is evident, reset the windcord.

Check up on the hinges and if one is bent out of shape open up the hinge as follows: To hang doors, to throw door away from the post, place a small screw driver between the hinge leaves and gently close the door. This will throw the door away from the hinge pillar or post. To throw the door toward the post, open the door and place a small piece of metal against the shrouded portion of the hinge—this will throw the door towards the hinge pillar.

Should the edge of the door bind on the body hinge pillar or post at the belt rail, adjust the door by throwing away from the pillar or post to which it fastens as shown in the illustration "springing door hinges." If this cannot be done due to the door not having sufficient clearance at the lock pillar side, set a small wood block in the door jamb as shown in the illustration, and gently spring the door shut. Should the door bind on the body pillar at the wheelhouse, adjust the door by throwing it away from the hinge, as described in the third paragraph of this section of the article. If the door binds at the bottom windbrake binding this may be remedied by using a screw driver as shown in the drawing, and gently springing the door shut.

Service Inspection

IN servicing all-steel bodies, it is a good idea to give those cars under your care a periodical inspection of the following points, for wear and lubrication, every 1,000 miles or so:

1. *Inspect body hold-down bolts for looseness. Keep them drawn up normally tight.*
2. *Examine door lock strikers (bolt keepers) for wear.*
3. *Check up on the door hinge pins for wear and lubrication.*
4. *Check up on the body shims. They must be of proper thickness to keep the door in alignment.*
5. *Make certain that hinges, locks and remote control regulators, etc., are tight.*
6. *The door bumpers and dovetails should be inspected, for wear and proper action.*
7. *Test the window glass for side play.*
8. *Keep the floor board screws tight.*

The lubrication, too, should not be overlooked. Periodically checking up on this will be found to give more satisfactory service all around. The following seven details should be given careful attention:

1. *Door dovetails and door lock strikers (bolt keepers) should*

(*Please turn to page* 50).

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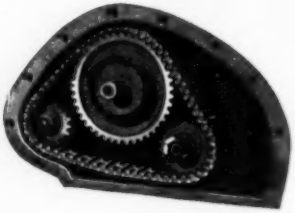
TIMING CHAINS

What You Should Know About Them



How to Make a Good Installation

By **J. F. McCann***

THE function of a chain drive in automotive front-end construction is to operate the cam shaft and accessories shaft in their proper relation to the crank shaft. This is done by means of accurately cut sprockets, the teeth of which mesh with chain links of a given pitch. The result is a minutely timed motor.

Owing to the fact that the chain is wrapped around considerable of the circumference of the sprockets, a large wearing area is obtained. Chain "stretch" is easily taken care of on many cars by automatic adjustments, while other cars using this type of drive provide a manual adjustment of some kind. Some chains stretch more than others, but it is safe to say that practically every manufacturer is making better chains today than ever before.

The most popular type of drive in use is the three-point drive, operating the cam shaft, accessory shaft with the crank shaft. On some three-point drives the accessory shaft sprocket drives the generator, distributor, oil pump and water pump. On other three-point drives the accessory shaft merely operates the generator.

The two-point drive is also quite popular. This type of drive operates the cam shaft in respective ratio to the crank shaft. Both of these drives are illustrated in Figures 1 and 2.

One high-priced car has for a long time used two vertical two-point drives in the front end. One of

Figure 1—*Two-point drive*

* *Chief Engineer, Duckworth Chain & Mfg. Co., Springfield, Mass.*

Let's figure this out

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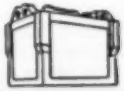
. . . . each battery 

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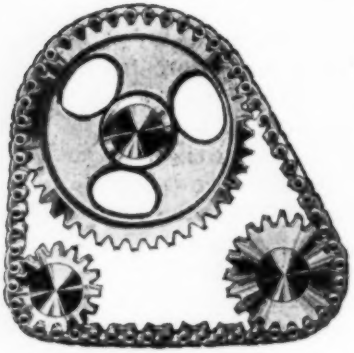


Figure 2—Three-point drive

these drives operates the cam and crank shafts, while the other operates the generator and fan shaft. See Figure 3.

Then there is the three-point drive with *automatic* adjustment. This type of drive has the advantage of taking up chain "stretch" by means of a spring actuated idler sprocket, which tightens the slack side of the chain drive between the crank shaft and accessories shaft sprockets.

The most popular type of chain is the "Silent Type," or as it is known in engineering circles, the "Inverted Tooth Chain."

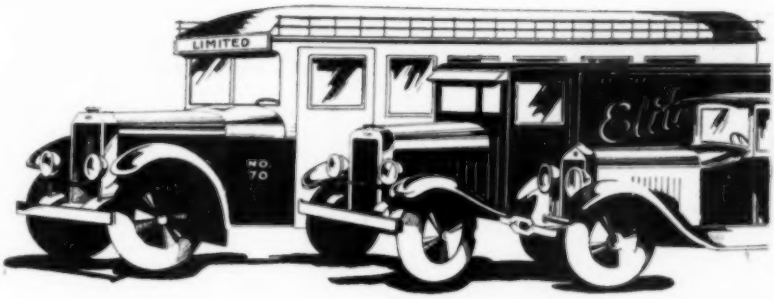
A great many of the timing chains for the three-point drives are manufactured "endless," or in other words, all the pins are riveted over, so that the chain is intended to be installed without removing a joint pin. To remove such a chain, the radiator and crank-case front cover should first be taken off. Then the chain adjustment should be moved to its minimum negative position; in other words, the adjustment should be moved so as to provide as much chain looseness as possible. Then the old chain may be removed from the sprockets with comparative ease. (See Figure 4.)

An excellent method of installing a new chain without having to bother retiming the whole motor is shown in Figure 5. Before removing the old chain, scribe a line on the cam shaft sprocket at the bottom of any tooth recess. Then scribe a line on the crank shaft sprocket in the same manner, counting up the number of chain pins between each scribed line. The old chain may then be removed and the new one put in place with the same number of chain pins between the scribed lines as the old chain had.

This method has been in practical use by many mechanics and works well, unless, of course, the old chain has "skipped" or jumped a tooth and is already out of time. In this case, the following procedure should be followed, after the old chain is removed:

Crank the engine until piston number 1 is on the upper dead center, on the *compression* stroke. This usually can be accurately checked by

Figure 3—Double vertical two-point drive



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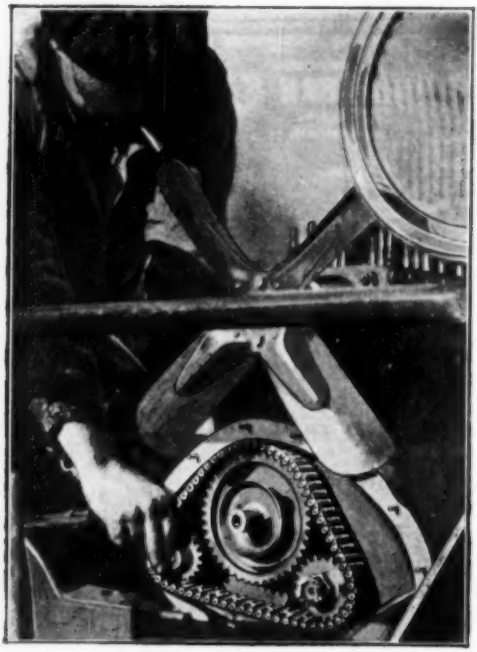

Figure 4—Removing the old chain

markings on the flywheel, which correspond with a pointer usually mounted on the housing.

Next turn the cam shaft sprocket until the prick punch marks on the teeth of the sprocket are directly between the two punch marks on the teeth of the crank shaft sprocket. The new chain may then be put in place, using the utmost caution not to move either the crank shaft or cam shaft sprockets.

On many cars it is the custom to have put one punch mark on each sprocket tooth. In this case care should be used that both marks face each other and that both are directly in line with the centers of both shafts. A straight edge or ruler can be used conveniently in lining them up, although this can be done well with the naked eye.

Some engines have but one center-punch mark on the cam shaft sprocket and one on the crank shaft sprocket. The number of links, pins or chain teeth to go between these two marks is usually marked in some manner on the inside of the chain housing or cover. If it is a pressed steel housing, the notation will be punched; on a cast housing it is sometimes cast in. The mechanic should always look carefully for these markings before going ahead with the job.

The ignition timing may be checked by getting top dead center, as before directed. The distributor cover should be removed, without disconnecting the wires, and the cam should then be set so that the rotating segment is directly under number 1 terminal on the distributor cap and the breaker points are just starting to break. This procedure is well known by practically every mechanic, I believe.

To check the ignition timing, disconnect number one spark plug wire and hold it about ⅛ in. away from the motor while someone else cranks the motor. When the spark occurs, the position of the fly-wheel can then be noted. (It should be exactly on top dead center.)

After checking the ignition timing

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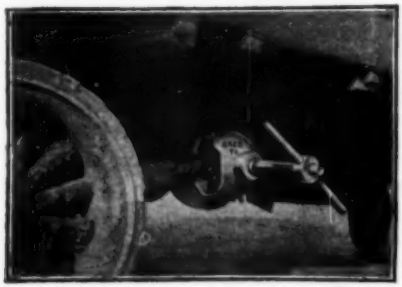

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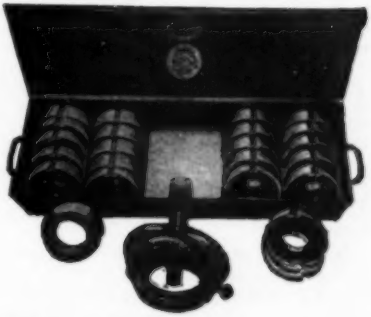

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it is a good idea to adjust the timing chain for road use by getting the right adjustment conducive to quietness of operation. This may be done by loosening the chain adjusting screws and pulling the adjustment so as to tighten the chain to its quietest adjustment and the chain will be set right. A tight chain will cause a hum, while a loose chain will usually manifest itself by making a clattering sound as it hits the side of the chain housing.

of course, should be removed. Leaving the old chain in place, turn the crank shaft over until the prick-punch marks or the letters "O" on one tooth of the cam shaft sprocket line up with the corresponding markings on the crank shaft sprocket.

In some instances it will be found that each sprocket merely has one marking opposite a tooth. In other cases the cam shaft sprocket has one mark and the crank shaft sprocket has two marks, one on each tooth.

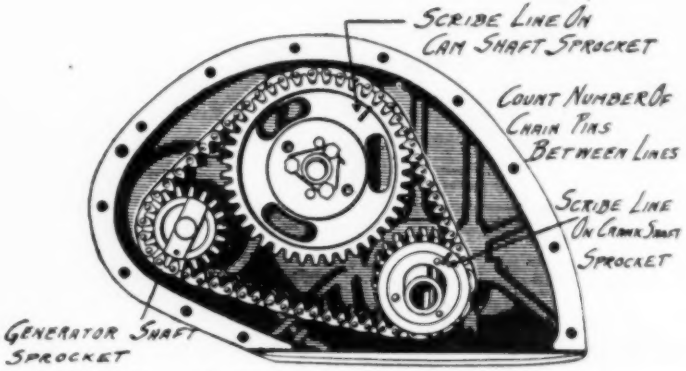
SCRIBE LINE ON CAM SHAFT SPROCKET
COUNT NUMBER OF CHAIN PINS BETWEEN LINES
SCRIBE LINE ON CRANK SHAFT SPROCKET
GENERATOR SHAFT SPROCKET

Figure 5—How to avoid retiming the motor

Usually a proper adjustment can be noted by grasping the generator sprocket shaft and turning it back and forth. One-sixteenth to one-eighth of an inch backlash usually affords sufficient looseness on the slack side of the chain drive for quiet operation.

It will be noted that the foregoing instructions applied to three-point drives. A word or two about handling a two-point drive job: To install a new chain on the two-point drive, the radiator and chain cover,

In the latter case the single tooth marking on the cam shaft sprocket should be lined up directly between the two markings on the crank shaft sprocket. This method usually takes care of the proper valve timing *before* the old chain is removed.

After having ascertained in the above manner that the valve timing is correct, there are two methods of mounting a new chain on a two-point drive:

(*Continued on page 29*)

Providing that the replacement chain has a connection pin which may readily be inserted through the chain links, and fastened securely by means of a cotter pin and washer, the old chain may be removed by shearing a chain pin with a cold chisel and pulling out a joint pin. The new chain may then be wrapped around the sprockets and joined together by means of the connection pin, with cotter and washer therein.

However, if the new chain does not have a connection pin, mechanics have found that it is an extremely tedious job to rivet over an ordinary joint pin in order to make the chain fast. In this case, after the valve timing has been ascertained by lining up the sprocket tooth markings, a sprocket puller should be applied to both the cam shaft sprocket and crank shaft sprocket and both pullers worked simultaneously until both sprockets are pulled off the shafts. The new chain may then be mounted to the sprockets endless (or without disconnecting the chain) and the sprockets put back and fastened to the shafts.

In one instance a popular make of car uses two vertical chain drives in the front end, one drive is from the crank shaft to the cam shaft, the other is driving the fan and distributor from the cam shaft. A chain installation on this particular motor may be made by employing sprocket pullers, working them simultaneously, and pulling both chain drives off together, without disconnecting the chains.

However, some mechanics prefer to pull only the two outside sprockets, and after connecting the inside chain together by means of a connection pin put the the outside drive sprockets back on their shafts, using an endless chain.

(*Please turn to page* 50)

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FIRST, for ACCURACY. All link surfaces which engage the sprocket teeth are ground and gauged for absolute uniformity. There can be no high spots to cause distortion and uneven pull.

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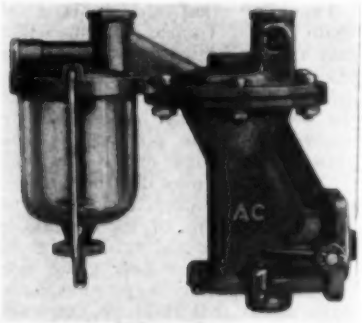
How to Service the

A. C. Fuel Pump

A Few Service Hints for the Fleet Mechanic



WHILE the construction of the fuel pump is such that servicing is seldom necessary nevertheless, there may be occasions when a pump needs attention from the service man. Service on this product is available through the many United Motors Service Branches all over the country, but there are many service operations that can be performed by any good mechanic in the fleet shop.

These will be outlined in this article, but before doing so it might be in order to explain just how the fuel pump works, so that the mechanic will have a better understanding of the job he sets out to do.

How Fuel Pump Works

BY revolving shaft (G) in the drawing opposite, the eccentric (H) will lift rocker arm (D), which is pivoted at (E) and which pulls the pull rods (F), together with diaphragm (A) held between metal discs (B) downward against spring pressure (C), thus creating a vacuum in pump chamber (M).

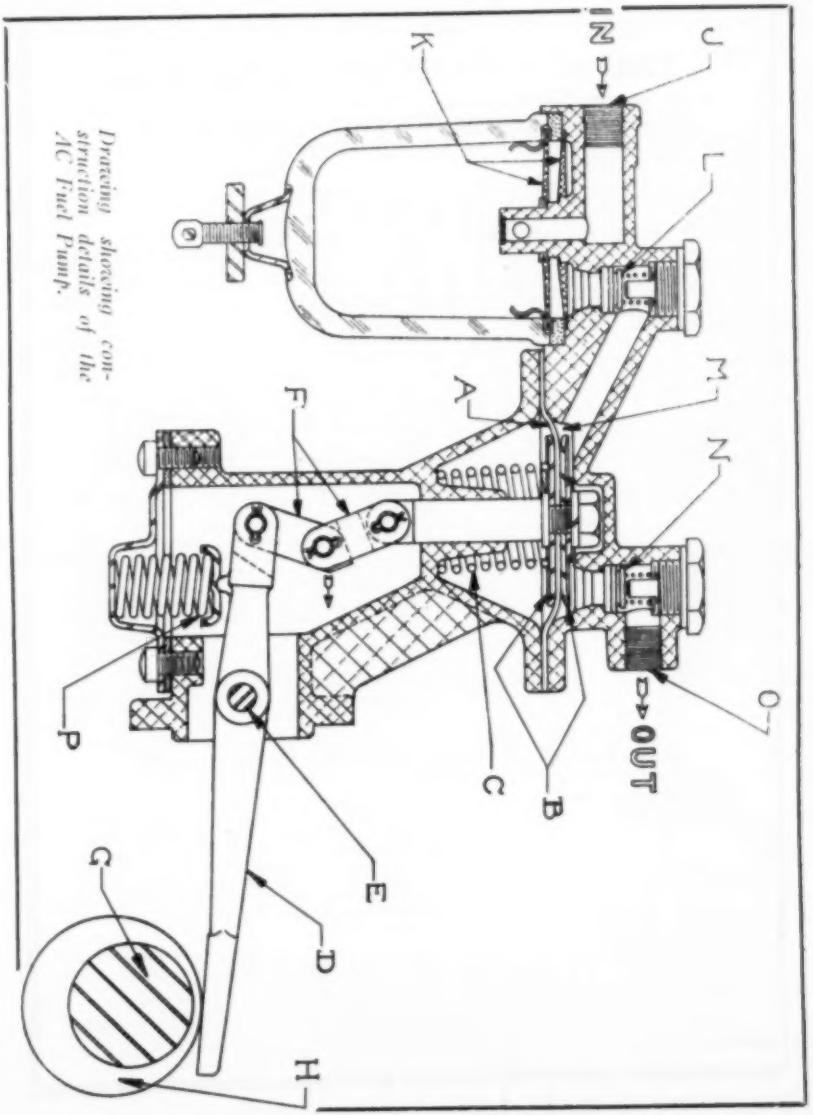
Fuel from the rear tank will enter at (J) into sediment bowl at the left, and through strainer (K) and suction valve (L) into pump chamber (M). On the return stroke, spring pressure (C) pushes diaphragm (A) upward, forcing fuel from chamber (M) through pressure valve (N) and opening (O) into the carburetor.

When the carburetor bowl is filled, the float in the float chamber will shut off the inlet needle valve, thus creating a pressure in pump chamber (M). This pressure will hold diaphragm (A) downward against the spring pressure (C) and it will remain in this position until the carburetor requires further fuel and the needle valve opens. The pull rod (F) is in two pieces and the movement of the eccentric (H) is absorbed by this "break" when fuel is not required.

Spring (P) is merely for the purpose of keeping rocker arm (D) in constant contact with eccentric (H) to eliminate noise.

It is important not to attempt to disassemble the fuel pump further than described on page 32 because it is quite necessary to use a special fixture in reassembling a pump when once taken apart. When the given remedies do not correct the condition, replace with a new fuel pump, sending the old pump to the nearest AC Service Station for repairs.

In many instances trouble will be attributed to the fuel pump which, in reality, is caused by some other condition. *(See chart on page 32)*



Drawing showing construction details of the AC Fuel Pump.

THE AC FUEL PUMP—Service Hints

LACK OF FUEL AT THE CARBURETOR

Cause	Remedy
Gasoline tank empty.	Refill.
Leaky tubing or connections.	Replace tubing and tighten all pipe connections at the fuel pump and gasoline tank.
Bent or kinked tubing.	Replace tubing.
Glass bowl loose.	Tighten thumb nut, making certain that cork gasket lies flat in its seat and is not broken.
Dirty screen.	Remove glass bowl and clean the screen. Make certain that cork gasket is properly seated when reassembling.
Loose valve plug.	Tighten valve plug securely, replacing valve plug gasket if necessary.
Dirty or warped valves.	Remove valve plugs and valves. Wash valves in gasoline. If damaged or warped, replace them. Examine valve seat to make certain there are no irregularities which prevent proper seating of valves. Place valve in valve chamber with the polished side downward. Make certain that valve lies flat on its seat and is not left standing on edge. Reassemble valve plug and spring, making certain that spring is around the lower stem of the valve plug properly. Use new gasket under valve plug if necessary.

LEAKAGE OF FUEL AT THE DIAPHRAGM

Loose cover screws.	Tighten cover screws alternately and securely. CAUTION: Do not disassemble the pump body. NOTE: Sometimes there appears to be a leak at the diaphragm, whereas the leak actually exists at one of the pipe fittings and the fuel has run down the pump to the diaphragm flange, appearing to originate there.

FLOODING OF CARBURETOR

Carburetor needle valve not seating.	Check carburetor for proper adjustment.

Service Chart for correcting faulty A. C. Fuel Pumps.

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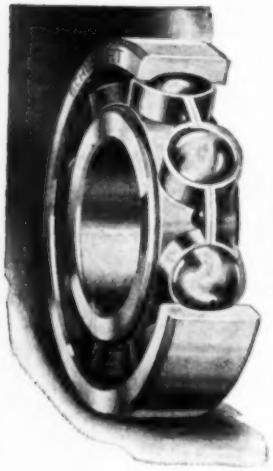

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At the end of the day's work the trucks are backed into "stalls" marked off on the floor and lined up against a platform which prevents their drivers from parking them flush against the wall. This is done so that in case of fire the extinguishers, which are placed at frequent intervals along the platform, may be used without their operators being hampered by lack of space.

No Fires *in this* Garage

How Rochester Gas & Electric Company's Fleet of 44 Coke Trucks Is Protected by Fire-Fighting Equipment

By George P. Hodges

THERE are still many fleet garages scattered throughout the country, which are little better than the makeshifts of twenty years ago, in which some fleet owners store their automotive vehicles. These makeshifts, for the most part, consist of nothing more than antiquated barns, remodelled buildings or other fire-inviting structures that were never originally designed for the purpose.

Despite the inconvenience of getting trucks in and out of such makeshift storage places, very real fire hazards usually exist, and even now it is not impossible for the owner of a fleet of trucks to awake some morning and find that fire has reduced his expensive investment to a mass of junk. Fire insurance might compensate him for the loss of the machines, but it does not repay him for customers lost because of interrupted deliveries, nor for the time lost in waiting until new machines can be purchased and placed in service.

However, this is the exception rather than the rule. Today modern business demands speed and promptness; it refuses to countenance needless delays. As a consequence, all over the country, huge garages are superseding the converted livery stables of yesteryear and countless organizations which operated huge fleets of trucks now maintain complete fireproof garages, equipped with every known device for promoting safety and preventing even a day's interruption of service.

Such a modern garage is now operated by the Rochester, New York, Gas and Electric Company and in it is housed the Company's fleet

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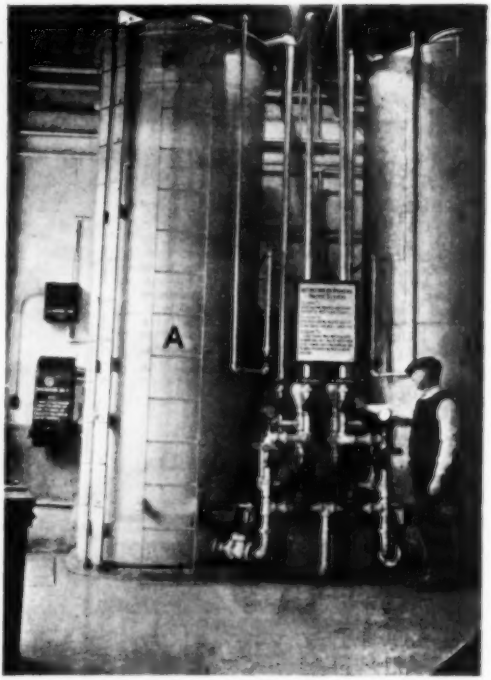
of 44 coke trucks. Not only is this garage of the most modern construction throughout, but it is safeguarded against fire by the latest and most efficient type fire extinguishing equipment available. This garage enjoys the distinction of being one of the best fire-protected garages in the United States.

From the moment the Company's coke trucks complete their day's deliveries and are backed into their designated places in the garage, until they are driven out the next morning, they are guarded against fire. Not only is fire extinguishing equipment adequate and of the best, but every precaution is taken to prevent fire. When the day's work is over the gas tank of each truck is filled with gasoline *outside* the garage and with a hose equipped with a shut-off nozzle.

When this has been done the trucks are backed into marked-off "stalls" on the floor. In order to insure against the trucks being parked flush against the wall and consequently preventing ready passage behind them in case of fire, a raised platform has been built near the wall to which the machines line up.

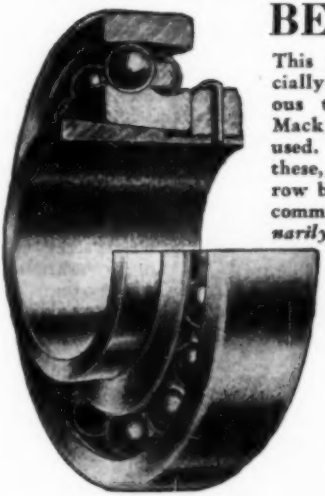
In addition to these precautions, each driver lifts the hood of his respective machine, leaving the motor compartment visible and quickly accessible so that in case of fire, valuable time will not be lost. As a further safeguard, the motor of each truck is wiped off at the end of each day.

Cleanliness is a byword throughout the garage, the floor is swept and washed each day and no debris is allowed to accumulate. Repairs are not allowed to be made in the garage, smoking is strictly forbidden and the use of gasoline or other in-



The two-solution system illustrated above is the backbone of the garage's fire protection system. Each of the tanks hold 1,200 gallons, respectively, of Foamite "A" and "B" solution. When the system is actuated, the two solutions unite to form Firefoam. Hose stations, located at strategic points about the garage, are equipped with hose reels, enabling operators to fight a fire in virtually any part of the garage.

SELF-ALIGNING BALL BEARINGS



This type bearing is used especially on Propeller shafts in various trucks. In the clutch of Mack Trucks size No. 2215 is used. Stock and Service on all these, as well as on regular single row ball bearings, at your instant command. Prices are *extraordinarily* attractive.

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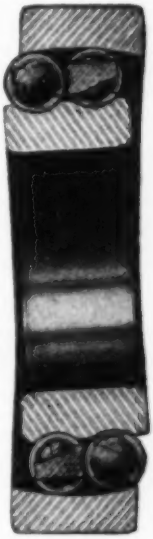

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flammable liquids for cleaning is likewise banned.

The backbone of the garage's protection against fire is a Foamite two-solution system. This system consists of a motor driven pumping unit, two solution tanks of 1200 gallons capacity each, and twin pipe lines connecting three hose reels placed at strategic points in the garage. In case of fire, the system may be actuated and operated by one man. It is capable of generating approximately 19,000 gallons of fire-smothering fire-foam.

Supplementing the Foamite System is a 40-gallon Foamite FM engine, 24 Foamite 2½-gallon extinguishers and a number of fire-guns installed in the trucks themselves. This combined equipment is cabable of handling practically any type of fire which might occur.

Above is pictured one of the Rochester Gas and Electric Company's fleet of 44 Coke trucks. In the last 10 years this fleet has operated for a total of 55,240 truck days and has covered an estimated distance of 1,644,092 miles without a serious accident.

A small fire involving the carburetor of a truck and perhaps ignition wiring, could be extinguished with a fire-gun; a larger fire could be extinguished with one of the 2½-gallon extinguishers; while a gasoline fire which enveloped one truck and threatened to spread to others could be successfully combated with the 40-gallon engine, or with the Foamite system, depending upon the size of the fire.

The fire protection in use by the Rochester Gas and Electric Company is not alone confined to its Coke Garage, however, for other buildings owned by the company are also so equipped. A notable example is the company's East Station gas manufacturing plant, where another two-solution system is in operation. This system is complete with standard pump, necessary piping, solution storage tanks of approved design, each of which holds approximately 12,000 gallons of solution, dissolving tanks, mixing chambers, hose stations, hose and miscellaneous equipment.

The installation of this complete and efficient fire-fighting equipment by the Rochester Gas and Electric Company was not simply a whim of officials of the company, nor was it authorized until a careful study had been made of the problems involved. Almost from the beginning they realized that especially in their business, time represented real money and that delays of any kind were costly and exas-

(*Continued on page* 41)

perating to their customers.

They likewise realized that the thousands of dollars invested in their trucks and buildings entitled them to the most complete protection against fire which it was possible to obtain. They did not stop merely with adequate protection against fire, however, for as in the case of the Coke Garage, other buildings were constructed with an eye toward making them as fire-proof as possible. Likewise, as in the case of the garage, every possible care is taken to prevent the spread and start of fire.

The company might have figured that their buildings and trucks were covered by insurance and that their investment was protected. They realized, however, that although insurance might compensate them for the loss of their trucks, equipment and buildings, it would be difficult to deliver coke or furnish light and gas on an insurance policy. Also, in the interim before a new fleet of trucks could be purchased and placed in commission and before new buildings could be erected, service would be virtually at a standstill and, consequently, an incalculable amount of business, which had taken years to build up, would be lost and perhaps never regained.

Utica Branch Moves to Elmira

ANNOUNCEMENT is made of the removal of the Utica office and plant of the American-LaFrance and Foamite Corporation, manufacturers of all types of fire extinguishing equipment, including motor fire apparatus, to the Company's main plant and general offices at Elmira, N. Y.

Under the new arrangement, the officials of the Corporation look forward to the greater advantages which centralization brings.

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Mack *announces* Model BC *Truck*

New Unit Has Six Cylinder Power Plant Designed for Heavy Duty, High Speed Service

THE latest addition to the line of Mack trucks is a new six cylinder truck designed for those fields where diversified hauling requirements demand power, capacity and high, safe speed. According to its makers, the new Model BC does not supplant any existing Mack model, but is instead a modern addition to the line.

Some of the interesting features of the new six cylinder engine are: a combined fan and water pump mounted at the front of the cylinder block, both driven from the one belt; crankcase ventilation provided by a flexible tube extending from the valve cover plate to the elbow on the carburetor intake; throttle control of the exhaust heat applied to the inlet manifold through a jacket on the riser; thermostatic temperature control. There is a by-pass to the path of the cooling water through the jacket space. When the temperature of the jacket water drops below 150 degrees, no water circulates through the jacket and circulation begins again when the jacket temperature rises above 175 degrees.

Another interesting feature of the engine is a high pressure lubrication system which operates under a pressure of 55 pounds per square inch and extends to main, connecting rod and camshaft bearings. An H-W filtrator is included in the oil circuit.

With a bore and stroke of 3¼" x 5½" the BC engine develops 100 horsepower at 2400 r.p.m. The six cylinders are cast in a single block with a separate single head. Pistons

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Elimination of replacement costs plus the flexibility and ease of application to any job, makes this tool an economic factor in your business.—The Howser Files-It Glaze Breaker and Speeder Wrench in a few turns breaks the hard glaze and prepares the valve seat for the finishing reamer. Write for information about this new tool.

Model "D"
Combination Model "B" and Universal Joint Speeder Wrench—making one complete unit. **$6.00.**

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Combination Model "A" and Universal Joint Speeder Wrench—making one complete unit. **$5.00.**

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are made of low-expansion aluminum alloy. Connecting rods are tubular, machined all over and are made of drop forged molybdenum steel. The crankshaft is mounted in seven main bearings three inches in diameter. The camshaft which is 1¼" in diameter is mounted in four bearings. The valves have flat seats and are located on the right hand side. Inlet valves are made of chrome-nickel steel and exhaust valves of chrome silicon steel. A mechanical vacuum booster pump is mounted on the crankcase on the right side and forward of the carburetor.

Ignition is by battery and distributor with semi-automatic advance. The electrical system is of the 12-volt type and of North-East make.

The clutch on the new model is of the single plate, dry type, with clutch housing and transmission bolted to the crankcase to form a unit powerplant. The transmission is a four speed unit with direct-drive on fourth.

In the Model BC truck, Mack has again made use of rubber shock insulation. All spring tips, the radiator, steering column and cab are rubber shock insulated. Final drive is by Mack dual reduction with inclined rear axle of banjo type.

The brakes are four-wheel internal expanding type. Augmenting them is a vacuum booster attachment, operating on all four wheels. Hand brake is mounted independently on the drive shaft. The total braking area is 750 square inches.

THE Burgess Norton Mfg. Company, of Geneva, Illinois, manufacturers of piston pins, valves, replacement clutch parts and clutch plates, recently announced that official endorsement of their products has been authorized by United Bonded Garages.

Oil Jack Buys Garage Utilities

THE Oil Jack Co., Inc., Ampere, N. J., makers of the Pedersen Oiljak line of hydraulic jacks, has recently purchased the business of Garage Utilities, Inc., of Hackensack, N. J., makers of the Hi-Lo horse and the Hi-Lo pedal depressor.

The equipment, machinery, and stock of the latter company have all been removed to the Oil Jack plant, the floor space of which has been materially enlarged to make room for the manufacture of the Hi-Lo line.

The Hi-Lo horses and pedal depressor will be illustrated and described in an early issue. Interesting circulars have been prepared and will be sent to interested readers on request.

Autocar Dealer Appointment

THE Autocar Company, motor truck manufactures of Ardmore, Pa., have appointed The Auto Truck Service Company, 2701 Main Street, Dallas, Texas, as official Autocar dealer for a territory of 12 Texas counties in the Dallas district. The new dealer operates from the same address as the former Autocar Direct Factory Branch at Dallas.

LaFrance-Republic Personals

C. A. HAMILTON has recently been appointed western sales manager for LaFrance-Republic Sales Corporation, according to announcement received from F. L. Pierce, vice president of the corporation.

A further announcement tells of the appointment of John H. Hansen, formerly of Velie Motors Corporation, as a member of their sales organization. Mr. Hansen will serve in the capacity of special travelling representative.

New Relay Truck *Announced*

Model 50D Available in Three Wheelbases and in 2, 2½ and 3-Ton Capacity Ratings

THE first public appearance of the new Relay Truck, Model 50D, just developed by Relay Motors Corporation, Lima, Ohio, will be made at the Road Builders' Show, Atlantic City, N. J., this month.

This new model is rated in three sizes, 2, 2½ and 3 tons, on wheelbases of 139½", 161" and 185" respectively. The shortest model is particularly adapted to dump truck operations, where short turning radius is necessay.

A six-cylinder, 3¾" x 5" Buda engine powers the Model 50D, through a transmission having five speeds forward and two in reverse. Two sets of brakes are used; service brakes are internal-expanding, hydaulic type, on four wheels. Hand brake contracts on the propeller shaft.

Standard tire equipment is 36" x 6" pneumatic front. The rear tire sizes will vary, as follows, although they are all dual installations: Two-ton rating, 36" x 6" dual pneumatic; two and one-half-ton rating, 38" x 7" dual pneumatic; three-ton rating 40" x 8" dual pneumatic.

The rear axle is Relay's own design—a pendulum suspension different than the conventional. Since the principle of the Relay axle has not heretofore been described in this publication, it might be in order to briefly outline its construction here:

The Relay axle carries the load on axle shafts, which are permitted to ride, forth and back, not unlike a pendulum. These axle shafts have pinion gears at their outer ends, so mounted that they mesh with an internal ring gear, fastened to each wheel.

Due to the fact that the axle shafts, in pendulum-like suspension, connect with the wheels at a distance from the wheel center, the weight of the load and body has a tendency

to keep the pinions directly below the center of the wheel, but as the power is applied a balancing of forces occurs. As the engine turns the pinions, they have a tendency to roll upward, within the ring gears, while the weight of the load tends to hold them from swinging upward. At whatever point on the internal gears, where the balancing of these forces occurs, at this point the road wheels will start rolling.

While the pinions are swinging upward, a pendulum force is developed, which as a maximum, approximates three times the weight of the truck. This pendulum force acts partly in a downward direction, adding weight to the truck and increasing the traction, partly in a horizontal direction, contributing an added propelling force to roll the truck on its way, it is claimed by Relay engineers.

It is these two powerful forces of the swinging pendulum, which have now been harnessed for transporting loads, to cushion shocks and to gain greater traction and increased propelling or stopping force, that provide the greatest advantages in this type of axle.

A very interesting booklet has been prepared that outlines and portrays the principle of the Relay axle. If you have not as yet received your free copy, a request to the Editor will bring one; or, if you prefer, write directly to Relay Motors Corporation, Lima, Ohio.

Truck Convention in Cleveland

ATTENTION of truck owners will be centered on the city of Cleveland next January 29 to 31 when important groups in the commercial vehicle world will assemble there for the convention sessions and for the commercial vehicle exposition which will be conducted in connection with Cleveland's annual automobile show.

On January 29, a special one-day session of the Truck Association Executives of America will be held, to be followed on January 30 and 31, by the annual convention of the Ohio Association of Commercial Haulers.

The Cleveland Automobile Show will be held January 25 to February 1, and because of the conventions scheduled a special commercial vehicle exposition has been made a part of the show.

Represented at the Truck Association Executives of America meeting will be the Motor Truck Club of Kentucky; Ohio Truck Owners Association; Cincinnati Team & Truck Owners; Pennsylvania Motor Truck Association; Dakota Motor Carriers Association; Minnesota Truck Owners Association; Iowa Truckers Association; Motor Truck Association of Connecticut; Motor Truck Owners Association of Chicago; Motor Truck Association of America; Nebraska Motor Transport Association; Ohio Association of Commercial Haulers; Motor Truck Club of Massachusetts; Maryland Motor Transport Association; Motor Truck Association of Indiana; National Team & Motor Truck Association; Wisconsin Truck Owners Association; Michigan Motor Truck Association; Louisiana Motor Transport Association; and the Missouri Truckmen's Association.

The exposition and convention sessions all will be held in one building—the Cleveland Public Auditorium which provides facilities for expositions as well as committee rooms and theaters for meetings.

And Now

Air-Flight Tires *by* Fisk

WHAT has been characterized by automobile tire engineers as the first real step forward in tire engineering since the advent of the balloon tire was announced recently by H. T. Dunn, president of The Fisk Tire Co., Inc., Chicopee Falls, Mass., whose engineers and technicians have developed a radically new method of automobile tire construction, embodying what is known as the "Air-Flight" principle, which permits the air in automobile tires to carry a much greater percentage of the load of an automobile than at present. The new Fisk Air-Flight principle results in greater riding comfort, longer life and fewer tire troubles.

"The development of this new principle of automobile tire manufacturing has been achieved only after several years of intensive research and laboratory work," Mr. Dunn explained. "It is the first really important change in tire construction methods since the advent of the balloon tire, which became popular almost overnight because it introduced to a limited extent the same principle.

"Briefly, the Air-Flight principle has resulted in increasing the size of the air chamber of the tire, permitting the car itself literally to ride on air. This has been done without sacrificing tire mileage because of other exclusive features which make the tire less rigid, prohibiting unequalized strains and giving tremendous strength and resistance to road inequalities and heat without the necessity of undue massiveness and thickness. At the same

time an increased length of flex area enables strains to be absorbed over a greater portion of the tire without concentration in one spot, rendering undue thickness unnecessary. The whole makes a tire perfectly balanced and adds considerably to the riding qualities of any car equipped with it.

"Before going into production on the new Air-Flight tires we put them to every conceivable test under actual operating conditions. The highly favorable results of these manifold and rigorous tests proved conclusively that the Air-Flight principle of tire design marks another milestone in the progress of tire-building.

"The Air-Flight principle has created a tire of such design that a larger proportion of the load of the automobile is carried by the enclosed air than is the case with balloon or high pressure tires. This, however, has been accomplished without in any way sacrificing the ability of the tires to do the work intended for them.

"Air-Flight tires resist to an amazing extent abrasive wear and strains set up by road inequalities. They resist also the action of heat and truly give the car owner the sensation of an air-flight, of riding literally on air. Motorists who were astounded at the improved riding comfort provided by balloon tires will be amazed at the difference between riding in a balloon tire equipped car and a car equipped with Air-Flight tires. Both tire and automotive engineers agree that the Air-Flight principle has advanced the riding comfort of automobiles as much as shock absorbers and balloon tires did in their day.

"Summed up, the advantages of the Air-Flight principle tires are: a larger air chamber, permitting the car to ride less on the rubber, more on the air; an all-cord construction which reduces internal friction and adds strength without rigidity or weight; this also makes possible increased cushioning. The multiple cable bead of these tires gives added strength at the rim, at the same time it increases sidewall flexibility. The increased length of the flex area at the sidewall provides a greater use of the air cushion. The rim-width, stream line tread eliminates the useless overhanging tread rubber and also allows greater air cushioning. There is also a greater road contact with Air-Flight tires and a newly perfected balance between air and materials which achieves the maximum of air cushioning and mileage."

Grapho to Make Pump Parts

ANNOUNCEMENT has just been made by the Grapho-Metal Packing Company of Indianapolis, Indiana, of the purchase of the Water Pump Parts Division of Echlin and Echlin, of San Francisco, California.

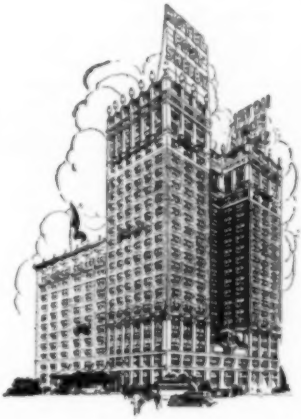
A few months ago Grapho, manufacturers of automotive water pump and axle packing, purchased the Detroit Replacement Service, of Detroit, manufacturers of DRS Water Pump parts and starting cranks.

To give prompt, dependable service to the industry warehouse stocks will be maintained in some fifty odd cities throughout the United States and Canada.

The success and growth of the Grapho-Metal Packing Company is outstanding. Less than five years ago the Grapho plant was housed above a garage in a residential section of Indianapolis. Today this organization occupies a modern two-story brick factory building.

Corner of
Lafayette and First

Look for the large green sign on the roof



To Those Who Visit Detroit

In the Fort Shelby is every facility for making your stay in Detroit a very pleasant one—900 reposeful, Servidor-equipped guest rooms, four excellent restaurants, and the thoughtful consideration of your needs.

Whether you choose one of the many excellent rooms at $3, $3.50 or $4 a day, or one of the especially large rooms or suites overlooking the city, or the river and Canadian shore, you will enjoy a particular sense of value in the Fort Shelby. Guests driving to the Fort Shelby are relieved of the care of their cars at the hotel entrance.

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Detroit

Maynard D. Smith, *President*

J. E. Frawley, *Managing Director*

Fenner in South America

HERBERT E. FENNER, general service manager of the American Bosch Magneto Corporation, Springfield, Mass., has sailed from New York to make an extended tour of inspection of all the principal cities in South America. Mr. Fenner will call on the branch houses and distributors of those American manufacturers who use American Bosch electrical equipment on their automotive products. He will also visit the official American Bosch service stations while there.

Servicing Steel Bodies

(*Continued from page 20*)

be lubricated with vaseline or graphite grease.

2. *Windshield hinge and adjusting arm should be lubricated with 3 in 1 oil, or a similar light oil.*
3. *Door locks, door lock bolts and door hinge pins should be lubricated with light oil.*
4. *Door lock outside handle shafts should be lubricated with light oil.*
5. *Door outside safety lock should be oiled with a few drops of light oil placed on the key just before it is inserted in the lock or use a light oil in an atomizer.*
6. *Window regulators. Lubricate the connecting link joints and gearing with soft cup grease or graphite grease.*
7. *Remote control. Lubricate the connecting link joints with light oil.*

In conclusion, we cannot be too emphatic in stating that it is seldom necessary to replace damaged or broken steel parts of all-steel bodies. It is so simple to weld and straighten these parts that replacement is seldom in order.

Because an all-steel body cannot splinter, crack or crush beyond repair under the impact of a collision, straightening and welding is the most logical procedure. It should be noted that any heating, due to welding or straightening, cannot harm the body as there is no wood to burn.

Facts About Timing Chains

(*Continued from page 29*)

A silent chain after having "elongated" or "stretched," due to long usage, may be shortened by taking out an offset link or "half link." This is merely a temporary means of shortening the chain and is not to be recommended, on account of the pro rated wear per chain pitch, which a worn chain has.

While taking out an offset link will automatically shorten the length of chain and prevent it from slapping against the side of the crank case, it will not remedy the above mentioned pro rated wear, or wear per individual chain pitch, and sooner or later the chain, due to the great difference between the normally cut sprocket teeth which wear very little, and the excessively worn chain links and pins, will cause trouble by skipping the sprocket teeth and virtually ruining the valve timing of the motor.

Owing to the fact that the bare cost of the chain is the least cost when a chain installation is to be made, it is strongly recommended that whenever a chain shows wear to the extent of slapping against the crank case when the adjustment is all taken up, that a new chain be installed. This will save the fleet owner a great deal of trouble, giving him the ultimate satisfaction he has a right to expect after having paid a fair price for his chain.

A Course *in* Automotive Ignition

By M. Mallory,

President, Mallory Electric Corporation

ARTICLE XVII [*How to Use a Milli-Ammeter*]

THE explosion that takes place within the combustion chamber is caused by the heat generated by the spark between the spark plug gaps, and, as the heat of the spark depends upon the volume of current in it, it is essential that the secondary current should be of high amperage as well as high voltage.

If the spark is of *low* amperage and *high* voltage, it will jump the spark plug gap, but this would not always cause ignition, because there would not be enough amperage in the spark to raise the heat to a point that would cause an explosion. *With weak sparks, that is, sparks of high voltage and little or no amperage, it is practically impossible to get perfect engine performance.*

There are many cars in operation in which the sparks do not contain enough heat to get the best engine performance. With these weak sparks, carburetor adjustment is generally difficult, and the engine does not have the power it should have because the combustion is incomplete. It will carbon up rapidly, and the unburned gas passing by the piston rings into the crankcase will dilute the oil, and the lack of proper lubrication will result in excessive wear on the working parts of the engine.

Weak Sparks Cause Slow Burning and Spitting through the Carburetor

THE spark starts the mixture to burn when the piston is at the top of the cylinder. If the spark is weak, the burning of the mixture is so slow that it continues to burn during the downward stroke of the piston and also the upward or exhaust stroke, and is still burning when the intake valve opens to take in another charge of gas. The burning mixture flashes out through the intake valve, which is known as the spit-back through the carburetor.

This is more noticeable when an engine is cold, because the mixture is cold and a cold mixture is slow burning. If the mixture would burn more rapidly, the burning or expansion would be completed on the downward or power stroke of the piston instead of continuing to burn during the exhaust stroke.

This slow burning causes loss of power, overheating of the engine and burning of the exhaust valves. Burning of the valves is caused by the burning mixture being forced

through them by the piston on its upward stroke.

Conditions That May Cause the Spark to Lack Heat

IF the spark plug gaps are spaced too wide apart, the spark will lose heat, causing spitting through the carburetor. If there is a gap somewhere in the secondary circuit, the spark heat is reduced.

For instance, the plunger in the center of the distributor cap may not be making contact on the distributor arm; the distance between the distributor arm and the distributor segments with which the spark plug wires are connected may be too wide; or the distributor segments or spark plug points may be badly oxidized or burned away.

All of these conditions offer a high resistance to the secondary current, which interferes with the passage of the current through the spark plug gap.

The practice of setting the spark plug gaps close together to overcome spitting is not advisable, because if the plug gaps are set too close the engine will run unevenly, especially at idling speeds. Better results are obtained by setting the spark plug gaps to .030 in. or .035 in. if the coil is powerful enough to fire across this gap and still carry sufficient heat. With the wider gap the spark meets a greater portion of the mixture. Spitting through the carburetor cannot be entirely eliminated, especially in cold weather, but it can be greatly reduced by increasing the heat of the spark used for ignition.

To Determine the Heat in the Spark

TO measure the heat or current that is in the spark a milliammeter can be used. It is connected into the secondary circuit as shown in Chart No. 17. This meter is connected between the coil and distributor and a reading of the secondary output can be taken while the engine is running.

It is best to take a reading of the spark when the engine is pulling and under compression. This can be done by using long secondary wires so that the milli-ammeter can be set in the front of the car and the operator can see it when the engine is running at all speeds and when pulling on hills.

The secondary output is always lower when the engine is on hard pulls than when idling because the compression is always the greatest when the engine is pulling and the lowest when idling. This high compression between the spark plug gaps offers a high resistance to the secondary current.

The reading of the secondary output will also be lower at high engine speeds. This is due to a decrease in the saturation period of the coil, which is caused by the circuit breaker in the distributor being closed for a shorter period of time at high engine speeds. The building up or saturation of the core of the coil depends upon the amount of primary current that flows through the primary winding, and if there is not sufficient current or if it does not flow for a sufficient length of time, the core of the coil will not build up to its maximum, resulting in a weak spark.

Although it is characteristic in battery ignition systems for the spark to grow weak as the speed of the engine increases, there are many other things that would cause the spark to be weak. It might be that the coil that is on the car is not powerful enough to overcome the resistance set up by the compression

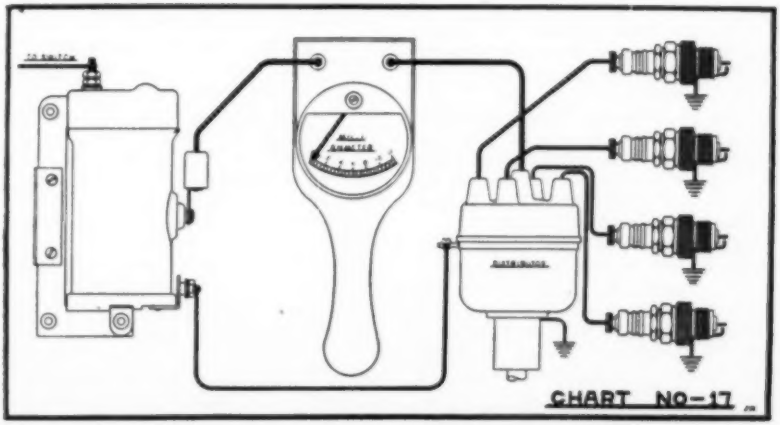
and other resistances that are in the secondary circuit. In this case, a more powerful coil should be installed. To determine whether or not it has a greater secondary output than the old coil, a milli-ammeter should be used.

It is impossible to set a standard reading to go by when testing with the milli-ammeter. For instance, two cars of the same make and model and having the same type ignition systems may show a considerable difference in the secondary output when tested with the milli-ammeter. One might have a high reading and the other a low reading. The conditions which bring this about must be clearly understood to use a milli-ammeter intelligently.

The first thing that should be done is to remove or change the coil from the car that has the high reading to the one that has the low reading. If the secondary output is not shown to be increased, then the trouble is probably caused by some of the conditions which would cause a weak spark as explained previously in this lesson.

Other things that will cause a variation in the secondary output are that some generators are set at a higher charging rate than others, which would cause the coil to become saturated to a higher point; the circuit breaker points may be spaced too wide apart, which would not allow the primary circuit to be closed for long enough periods to completely saturate the coil; or a weak circuit breaker spring may cause the reading to be low at high engine speeds.

The greatest variation generally will be due to the coil itself. One coil will read only 1½ or 2 milliamps and another more powerful coil placed on the same car will read 4 milli-amps. This is due to the design and construction of the coil. In addition, a six cylinder car will show a greater secondary output than a four cylinder car because of the greater number of spark pulsations.



Measuring the output of a coil with the milliameter

The Trouble Shooter

A DEPARTMENT devoted to correspondence from readers of The FLEET OWNER. Any questions having to do with fleet maintenance will be answered. All properly signed inquiries will be replied to by mail and such of them as are believed to be of interest to other readers will be published in these columns.

Address your questions to the Trouble Shooter Editor. We must decline to reply to correspondence not signed with the writer's full name and address. The inquirer's name will not be published.

Putting on a New Timing Chain

Question: Will you kindly let me know how many links or chain teeth there should be between the camshaft and crankshaft sprockets on the Lycoming motor model 2-H, used in an Auburn 8-63, 1925 car?

I am having some trouble in getting the timing right.—H. P., Como, N. J.

Answer: There should be twelve teeth between the center punch marks on these two sprockets when the chain is applied.

Another and easier way to do this job is to locate these marks, turn the sprockets so that the marks face each other and then line them up with a straight-edge that is placed on the centers of both shafts.

By having the centers of both shafts in line with the center punch marks, (the marks should be on the inside of course) and then applying the chain the job will be in proper time. The ignition timing, with the spark lever retarded should be 10 deg. or .034" after top dead center.

By separate mail we are sending you a manual on timing chains and also a handbook which will undoubtedly be of assistance to you in valve timing.

(Editor's Note: Should any of our readers desire copies of these books we will be very glad to send the same free, and without obligation. Just write to the Editor, using your letterhead; ask for the "timing chain books.")

Fuses on 1928 Studebakers

Question: Where are the fuses located on the 1928 Studebaker Dictator? We do not seem to be able to find anything except a funny looking contraption on the back of the instrument board that looks something like a generator cutout. Your advice would be helpful in this matter. We are subscribers and enjoy reading the Trouble Shooters' Department.—J. H. L., Bogota, N. J.

Answer: This contraption which you noticed on the back of the instrument board is an "electrical safety valve" which eliminates the necessity of fuses. A rough sketch is shown herewith.

In plain language, this "Safety

Valve" consists of a buzzer mounted on the back of the instrument board. When a short circuit occurs in the wiring system, the driver hears the sound of the buzzer and knows that something has gone wrong.

The buzzer goes into action as soon as the current builds up to 18 amperes and then prevents more than 12 amperes from passing through the wiring system. With the old system of fuses to protect the wiring system, a short circuit that blew a fuse would perhaps disable the headlights or some other part of the electrical system.

The "safety valve" has a circuit breaker, instead of fuses, to protect the wiring in case of a short. As soon as the grounded connection is remedied, the buzzing will cease and there is nothing to replace.

Sometimes the buzzer points will make poor contact, or stick open, causing an "open" in the lighting circuit. If this happens, the points can be reset by touching the flat spring with the finger. This operation completes the circuit and the lights should then burn when turned on.

Setting Lanchester Balancer

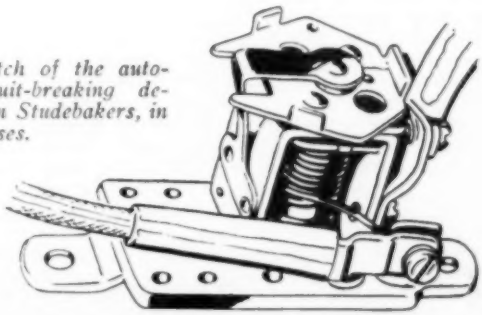
Question: On a 1925, 4-cylinder Willys-Knight, how do you set the Lanchester Balancer? We have tried lining up the marks on the crankshaft and balancer gears, but this results in a terrible vibration. We have not taken the balancer, itself, apart. Where are we wrong? —Mr. P., Brooklyn, N. Y.

Answer: Perhaps the markings are wrong, since your following them produces vibration. It is not necessary to take the Lanchester Balancer apart, but it must be installed in proper relation to the crankshaft. If you will follow this procedure you will have no trouble:

Forget about the marks. Turn engine so that pistons number 1 and 4, or 2 and 3 are at top dead center. With crankshaft in this position, take the balancer and let it fall to a natural position. The weights, or heavy sides will then be at the bottom, and the light sides at the top.

With balancer and engine in these respective positions, mesh the gears and your job will be set up right.

Rough sketch of the automatic circuit-breaking device used on Studebakers, in place of fuses.



Trouble Shooters' Department *(Continued)*

Timing Valves on Autocar

Question: Can you give me the valve timing on a 1922 Autocar Truck? This is a four-cylinder job, with a 4 in. bore, model H or K. I am not sure which it is.—W. E. C., Orange, N. J.

Answer: The valve timing on this job follows: It should be remembered that the tappets must be adjusted to a clearance of .005 in. before attempting to time this engine.

Intake opens 10 degrees past TDC.
Intake closes 30 degrees past LDC.
Exhaust opens 35 degrees before LDC.
Exhaust closes 10 degrees past TDC.

The above valve timing applies to all Autocar engines that have 4 or 4½-inch bores; also all years from 1922 to 1926 inclusive. We are giving you both the openings and closings, so that you can properly check.

Where Does the Oil Go?

Question: I have a 1927 Durant 4 in the shop that has me about stumped. I have to add a quart of oil every 75 miles. Had the motor down twice and installed different oil rings each time; the pistons fit well and there isn't any sign of an oil leak. I have tried all kinds of oil but it gets away just the same. Where does it go?—R. & V., Cissna Park, Ill.

Answer: Inasmuch as you have paid particular attention to the rings and pistons of this motor it does not seem possible that this oil is being consumed. If it were, you surely would notice the carbon residue upon removing the spark plugs or taking off the head.

There is a possibility that the oil is leaking out somewhere. We would suggest that you spread newspapers on the floor of your garage underneath the car and run the motor at a speed comparable to about 30 m. p. h. for about a half hour, anyway. You can then notice if the oil is leaking out.

If there is no sign of an oil leak and the oil level is noted to be considerably lower, you then will be assured that you are burning this oil. This means that your ring job was not a good one. Either you had the wrong type of rings or they were not properly installed.

Removing Broken Axles

"TO replace a broken axle in the ordinary housing such as the Timken three-quarters floating type, which has been the standard equipment of all Peerless cars for the past fourteen years, requires more or less time and equipment dependent upon what part of the axle is broken.

"The first process is to set the change speed lever in high gear position and jack up the rear axle to ascertain which side of drive has been affected. After this is done, remove rear wheel and if axle is broken near the outer bearing, a wire loop can be hooked over the remaining portion of axle and drawn out. Should the axle not yield to a reasonable pull, it is then necessary to remove the other wheel and drive the axle out with a suitable bar.

"In case the axle is broken close up to the differential unit and there

is no chance for the wire loop, then it is important to get the short piece of broken axle free from the axle driving gear by bridging across the space between the differential unit and the housing proper. If the short end drops down in the housing, the rear cover, or unit must be removed, which requires time that could be saved by a little precaution.

"A suitable bridge gutter is made by bending to half-round shape a piece of tin about eight or ten inches long and taping it to a new rear axle inner end about five inches projecting in the clear. Set this axle with the tin gutter on it clear to the differential unit bearing so that the small end of the broken axle can fall down when driven from the opposite side.

"The simple replacement of a rear axle shaft after breakage is not all to complete the job of repairs and a general inspection should be made of all driving parts to pick up lost motion and to reduce the severity of the clutch engagement, unless it is determined that the axle shaft was defective or some unusual condition caused the breakage."—*W. J. M.*

Burns Up the Valves

Question: I have in the shop a Durant motor, 1923 model, which burns up the valves. The valves don't last very long. We put in three sets last summer and also new guides. It will only go about 30 miles per hour at the best. If you can give us any information we will be very much obliged.—J. W., North Manchester, Ind.

Answer: Without seeing this car, it is rather hard to diagnose the case, although it looks very much like you failed to allow sufficient clearance at the valve tappets. This should be between .006 in. and .008 in. *when the motor is hot.*

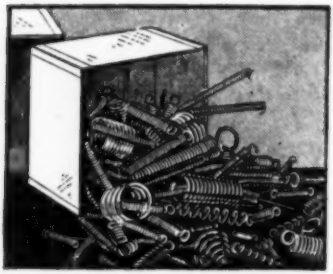
Another thing, we would suggest that you take the valve springs to your jobber for a test. These springs might be very weak and since you have installed new guides, it is possible that the valves are a tight fit and are not closing completely, or are closing too slowly. Valves in this condition often are the cause of keeping down the maximum speed of the car on the road.

It is also possible that your engine is out of time and before doing anything we would suggest that you check both valve and ignition timing. One thing more, it has often been said that the use of certain gasolines sometimes has bad effects on the valves; particularly the exhaust valves. We would suggest that no fuels of unknown make be used. There are any number of good grades on the market, all of which are known by name, so that there is no excuse for using anything but the best.

Whatever Your Question

We shall be glad to give you the benefit of our knowledge and experience. The columns of The Fleet Owner are open to its readers. Send in those hard knots. If we cannot solve them we will refer them to people who can.

The Trouble Shooter Editor.



What YOU

New Products of Interest

Peck's Spring Assortments

FOUR assortments of automotive springs are offered by Peck Spring Company, Plainville, Conn. Assortment No. 1 is shown herewith, and contains 100 steel and brass springs in both extension and compression varieties, to include almost every kind needed in the fleet repair shop. List price is $1.50.

Other assortments are No. 2, 2A, and the brake spring assortment, which all are good, handy sets to have around the shop, depending on requirements, of course. The brake spring assortment, as well as the No. 2 and 2A, are neatly arranged in wooden boxes, pigeon-holed off, so that the right spring can easily be found.

Write for catalog giving details and prices, directly to the above company, or to the Editor.

Offers "Taxi" Lining

A NEW brake lining, especially designed for taxicab service, is announced by Worldbestos Corporation, Paterson, N. J. It is called "Grafild '93' Taxi Lining."

This new lining was brought out after tests which proved its adaptability to many of the old types of external brakes on such cars as old Dodges, Buicks, etc., a great many of which are at present in use as taxicabs, according to J. N. Kirk, sales manager of the company.

It is also particularly suited to all external brake jobs where extreme service is required of the lining. This does not replace the regular "93" brand of Grafild lining previously announced by the Worldbestos Corporation. Should you desire a free sample of this lining, write to them, or to the Editor, if you prefer.

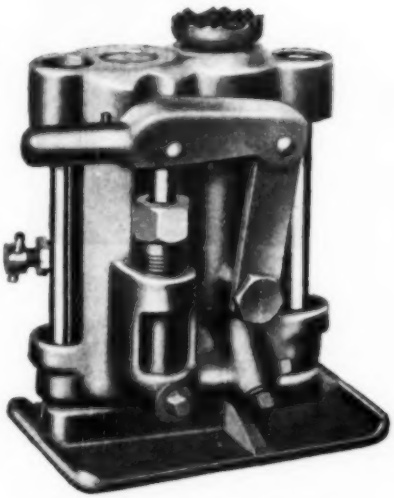
Warner Flywheel Gears

AN announcement of great interest to the fleet trade comes from Warner Gear Company, Service Parts Division, Muncie, Ind., giving particulars on a new line of flywheel starter gears just developed.

The new line will bear the well-known Warner trade-mark and the quality will be "Warner," the service "Immediate," and the prices "Right," according to the advance statement issued by the company.

Complete stocks will be carried at all Warner branches and at the factory. A new catalog has been prepared and is being sent free. Ask for Catalog SF-1930 and price list.

WANT to KNOW



Aristocrat Model Oiljak

ILLUSTRATED here is the new Aristocrat Model Oiljak, offered by The Oil Jack Company, Ampere, N. J. This is a special model designed for passenger cars of the modern low-hung type. Other models are offered in 3, 5 and 10-ton capacities.

As the name implies, the Oiljak is a hydraulic jack. The two-piece tubular steel handle, 36 inches long, with bayonet lock, together with skid-shaped base, permits placing it directly in position under either front or rear without crawling under the car.

Long or short strokes raise the load to any desired position. The malleable iron body of the jack makes it practically indestructible. Write to the makers for illustrated circular, or directly to the Editor, if you prefer. The heavy duty models (not illustrated here) are of especial interest to fleet operators.

Interwoven Clutch Discs

KNOWN as "Hoof Guay," interwoven clutch discs, offered by John C. Hoof Company, 162 N. Franklin Street, Chicago, are here illustrated.

These discs are made by a patented process, whereby strands of 1/8 inch asbestos rope are so interwoven that they become interlocking, eliminating the use of rivets and minimizing slipping. They are made for all cars and trucks using single-plate clutches.

A complete catalog of service parts, as well as a "Mechanic's Guide Book," are offered by this company, to fleet owners. When writing for same, mention this publication.

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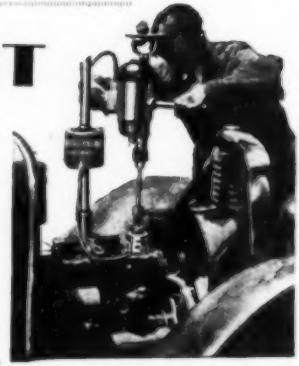
EQUIPMENT *for* GARAGE *and* SHOP



Glaze-Breaker Speed Wrench

THE combination glaze-breaker and speed wrench shown herewith is a tool that is designed to perform the roughing operation in a valve reseating job. Its trade name is "Howser Files-It Glaze Breaker."

The B. & H. Manufacturing Co., Indianapolis, Ind., are the makers. Here are some of the advantages as pointed out by them: pilot is self-adjusting to any valve guide; cutter is adjustable to any size valve seat; roughing surface is renewable; removes the glaze without taking off too much of the valve seat stock.

Briefly, the cutting element consists of three holders into which are inserted pieces of round file stock. As the files wear out, they can be turned around until their entire circumference is used.

Some interesting literature has just been prepared and will be sent on request. Write to the above company, or to the Editor.

Free Wheel and Axle Manual

THE Bear Mfg. Co., has prepared a 32-page booklet on wheel and axle alignment which is being distributed free to service men. This tells in detail the correct method of

procedure to find and remedy the causes of tire scuffing, hard steering and shimmying. It also contains a complete tabulation of manufac-

turers' specifications for pitch, toe-in, axle caster and king pin inclination.

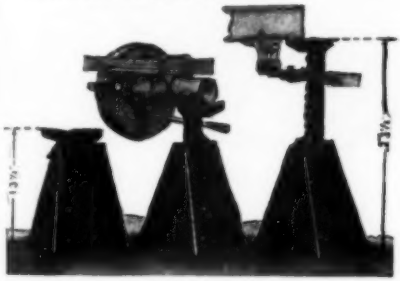
A chart is also offered which shows these specifications for all cars and trucks in convenient fashion.

Copies of these will be sent without cost or obligation by writing directly to Bear Mfg. Co., Dept. 1110, Rock Island, Ill., mentioning this publication.

"Hi-Lo" Horses

OFFERED in four sizes to meet every requirement, the new Hi-Lo Horses, now being made by The Oil-Jack Company, Ampere, N. J., are shown here.

This horse is of the all-steel type, all parts being either steel-plate or drop-forged. In the various sizes, they will fit under either the frame or the axle, minimizing the number of horses required.



The easy-working ratchet construction with drop-forged steel panel provides instant one-hand adjustment—a distinctive feature. They are built on the sky-scraper principle, with nothing to wear out.

Write to The Oil-Jack Company, Ampere, N. J., for descriptive literature on these new horses and also on new oil-jacks, mentioning this publication, if you please.

Air Compressor Unit

HERE is an air compressor for general use, consisting of a 2 H.P. unit, with a 60-gallon tank. It

will do all your tire inflating, operate a paint spray outfit, as well as one hydraulic hoist or air-operated gasoline pumps.

The makers, Auto Compressor Company, 203 Mulberry Street, Wilmington, Ohio, will be glad to send a bulletin that fully describes the same on request. Ask for information on Model T-58, and mention this publication, if you please.

New Gasket Catalog

A NEW 1929-30 edition of Fitzgerald's complete "Never-Leak" master gasket catalog is offered free to our readers.

If you haven't received your copy, write to Fitzgerald Mfg. Co., Torrington, Conn., mentioning this publication, or directly to the Editor, if you prefer.

The new catalog, not shown, illustrates and describes a complete gasket service and should be in every reader's hands.

Toledo Valve for Model A Ford

A RECENT addition to the Toledo Valve line is a valve for the Model "A" Ford, known as X615.

This new valve number has grey iron head permanently welded to the cold drawn stem. The head can neither come off nor work loose and both head and stem are machined to close tolerances, according to the makers, the Toledo Steel Products Co., Toledo, Ohio.

A number of tests more severe than any to which a valve would be subjected in actual use have proved that this Model "A" Ford valve will deliver the same satisfactory service characteristic of the complete Toledo Valve line, the announcement further states.

Ambler Pump Packing Rings

THIS is a packing of braided asbestos yarn, lubricated and graphited, made especially for water pumps on cars and trucks and offered to the trade by Keasbey & Mattison Company, Ambler, Pa. Its trade name is "Ambler."

The rings are split to make application easy. The sizes are accurate to the shaft diameters, insuring tight boxes, and are not affected by alcohol or other radiator solutions, it is claimed.

A handy garage assortment consists of a display carton containing 200 assorted packing rings for 28 popular cars and six types of Continental engines. List price $20.00 per assortment; refills can be had at 10c each ring.

Berkley Fly-Wheel Lathe

A RUGGED, clean-cut, precision machine for turning down flywheels prior to the application of starter gears has recently been developed by the Accurate Gear Co., Springfield, Ohio. It is called the Berkley.

This lathe is simple in design and embodies the application of proven machine tool design. It is equipped with individual, self-contained motor drive, employing a ¾ h.p. motor.

It has a universal, three-jaw chuck with micrometer feed adjustment; weight 900 lbs.

Fuel Specifications

(Continued from page 14)

with the Foutz cooling system. This is a closed water-cooling system which heats up quickly and operates at temperatures considerably higher than those of the conventional system and which are uniform under varying external conditions. Here again, the high-end-point gasolines have developed appreciably more power and shown no effect on dilution, and undoubtedly because of the high cylinder-wall temperature.

Curves plotted from the daily operation of these tests, including also relative atmospheric humidity and temperature, show evidence of an increase in miles per gallon with an increase in humidity. Tests conducted at the Bureau of Standards have shown decreased horsepower with increased humidity. No definite conclusion has been reached at this time as to the reason for the results indicated in the Baltimore tests, but it seems that under certain conditions, with the engine operating normally much under full power, an effect may be produced on the combustion mixture which tends to give better operation of the engine as a result of greater moisture content of the air.

Tests of each grade of fuel in one of the groups of motorcoaches are continued for a full month and an effort is made to keep the equipment in about uniform condition. A general inspection is made at the end of each test. Such tests may be open to criticism on the ground that there are many factors which cannot be measured. However, they have one advantage over laboratory tests in that the fuels are subjected to the conditions which have to be met in practice. An operation of 25,000 vehicle-miles over a period of one month should about average up all the various factors.

Fuels Improved by Research and Cooperation

THE research which is being carried on in the laboratories of the Bureau of Standards and of the oil companies have made possible the development of qualities in fuels to meet the various conditions occurring in practice and have brought about an improvement in fuels now available, but so far nothing is available from such research which the operator can use in making his purchases.

There is no question that the engineers of the petroleum industry have improved their products. Better fuels are available now than could be obtained some years ago. Also, the very close cooperation among engineers of the petroleum and automotive industries has improved the efficiency and economy of the internal-combustion engine. Possibly some room for argument exists as to which of these two industries leads and which follows. The petroleum engineer says that the development of the fuel has followed engine design; on the other hand, the engine designer claims that the changes in the engine have followed the development of oil refining and the qualities of the fuel available from time to time. It is generally true that the manufacturer of engines is dependent on the fuel companies in that his design of manifolds, combustion-chambers and other engine parts can be substantially affected by any radical change in fuel. Engine design necessarily follows, in many of its details, in the wake of a fuel change.

As a result of this cooperation brought about with the assistance of the Bureau of Standards, oil com-

panies are fully aware of the difficulties of engine design as affected by material changes in the fuel, and are working with the engine manufacturers in this respect.

It is perhaps of some importance to the operator for a decision to be reached as to whether engine design should or should not follow fuel changes. Seemingly the engine design should necessarily follow the fuel, because the conservation of our crude-oil supply is of National economic importance, and everything must, therefore, be subordinated to obtaining the most economical use of our crude-oil. That places a great responsibility upon the petroleum engineer to keep both the automotive engineer and the operator informed as far in advance as possible of the trend in the development of fuel from crude-oil whenever any possibility of change seems to be likely. The operators and the engine manufacturers are in the hands of the oil companies and cannot write specifications for fuel that will have much effect on refining processes.

The only way in which a specification can be obtained that will ensure to the operator a fuel in a competitive market that will meet his definite requirements is by the same kind of cooperation between the petroleum industry and the operators that obtains between the petroleum industry and the engine manufacturers. The petroleum industry has done considerable research work to ascertain the qualities needed to give the operating performance that is required. It can also produce means to be used either, in lieu of or supplementary to the present chemical analysis universally used for conveniently testing or checking fuel purchased.

Some Spectacular Experiments

PERHAPS the situation has not been thought of in this way, but the operator is like the innocent bystander; any change made by the engine designer or the gasoline producer leaves the operator in a quandary. Operators are, of course, trying to help themselves. Experiments and studies such as we have been conducting in Baltimore are being made by most of the large transportation companies, and some of these experiments are more or less spectacular.

For example, we have been experimenting in Baltimore for four years with an improved cooling system which not only assures adequate cooling at all loads, because its capacity for the dissipation of heat varies directly with the load on the engine, but also makes possible the operation of the engine at considerably higher cylinder-wall temperatures. This is the Foutz System, with which the four-cylinder engines used in the fuel tests previously mentioned are equipped.

The advantages of higher and more uniform cylinder-wall temperatures are well understood, and efforts have been made for a number of years by automotive engineers to develop a cooling system that would give these results. The system in use on our motorcoaches seems to solve this problem and, although the manufacturers have so far manifested little interest in it, they undoubtedly will realize its advantages. It is also of interest to the petroleum industry in that it should make possible the utilization of a somewhat lower grade, and therefore cheaper quality, of gasoline.

Another of the spectacular experiments has been the effort to use a so-called crude oil in the gasoline

engine. For this purpose a vaporizer has been developed which ensures the vaporization of this fuel before it enters the cylinder. As this fuel probably corresponds somewhat to the gasolines of 1917 to 1919, it is very likely that its use would bring back the dilution troubles of that time. Even the use of vaporizers may not prevent this, for with such fuels dilution probably is caused, not so much by failure to vaporize in the first place, as by failure to remain in the vapor state in the cylinder. Maintenance of higher cylinder-wall temperatures by means of the cooling system referred to, might solve these difficulties.

These fuel-oil tests are being made exclusively on gasoline-electric motorcoaches. Considerable difference might exist in its use on these vehicles as compared with a mechanically driven vehicle. The conditions of starting and accelerating are not the same, and an electric drive probably tends to smooth out any uneveness in power delivery by the engine, although a somewhat greater loss occurs between the engine and the rear wheels. The results, however, will make a valuable contribution to the study of automotive-vehicle operation.

A third spectacular experiment is the effort being made by a large-fleet operator to go directly to the Diesel engine, using ordinary fuel oil. A motorcoach equipped with such an engine was driven to Atlantic City during the American Electric Railway Association convention, held there from Sept. 28 to Oct. 4, 1929. We were told that the oil consumption produced about 8 or 9 miles to the gallon and that the fuel cost but 5 cents per gallon as compared with 11 cents for gasoline. The statement was made that the use of these engines was entirely experimental and that no claims are made for it except that it holds interesting possibilities. Here, again, the cooling system in use in Baltimore might be very desirable; in fact, it is probably of even greater importance on the Diesel engine than on the gasoline engine. The advantages of the quick warming-up, uniform temperatures under all conditions, higher cylinder-wall temperatures, and the great reduction in the quantity of water, with resulting reduction in water-jacket size, would greatly simplify the use of Diesel engines on motorcoaches or trucks, and also in other applications.

I mention these several experiments because they represent efforts on the part of operators to find a way of using fuel of low grades. They may indicate to the oil companies and the engine manufacturers that the large-fleet operation will make it possible for operators to influence the development of engines and fuel, and show them the ideas at present prevailing in the operator's minds.

(Editor's Note: More of this interesting discussion on Fuel Specifications will appear in our next issue. The balance of this paper will take up such subjects as Methods of Purchasing Fuel; Kinds Being Purchased; Specifications of the Future; etc. Watch for this.)

New Warehouse for Lempco

THE Lake Erie Metal Products Company, Bedford, Ohio, announces removal of their Chicago warehouse from Wabash Avenue and Twenty-first Street to 323 West Polk Street, effective recently.

Larger stocks and more efficient warehouse service are established at the new address. The firm name has recently changed to "Lempco Products, Inc."

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New Addition to Bosch Plant

INCREASED sales in both automotive and radio products have made necessary the erection of an addition to the plants of the American Bosch Magneto Corp., Springfield, Mass.

The new building is partly of saw-tooth and partly of regular two-story construction and when completed will house the heat-treating, hardening, sand-blasting and scrap-reclaiming departments. It will also house the store-rooms for maintenance supplies, sundry production supplies and the shipping department.

Another new and smaller building has just been completed by Bosch to house oil and paint supplies. It is expected that the new building will be ready for occupancy before the end of 1929.

Russell Appoints Cortright

ANNOUNCEMENT has been made by the Russell Manufacturing Company of the appointment of Mr. J. A. Cortright, as assistant division manager in their San Francisco branch office.

Mr. Cortright, who is well known locally, will act as a contact man between the various distributors and dealers in Rusco Products and the factory branch at 727 Van Ness Ave., San Francisco, Calif., presenting a first hand knowledge of the trade's needs to the factory engineers, production managers, and automobile trade.

It will be one of his duties to gauge accurately the volume of San Francisco business so that the company will be in a position to anticipate dealers' needs and be able to fill orders immediately upon receipt.